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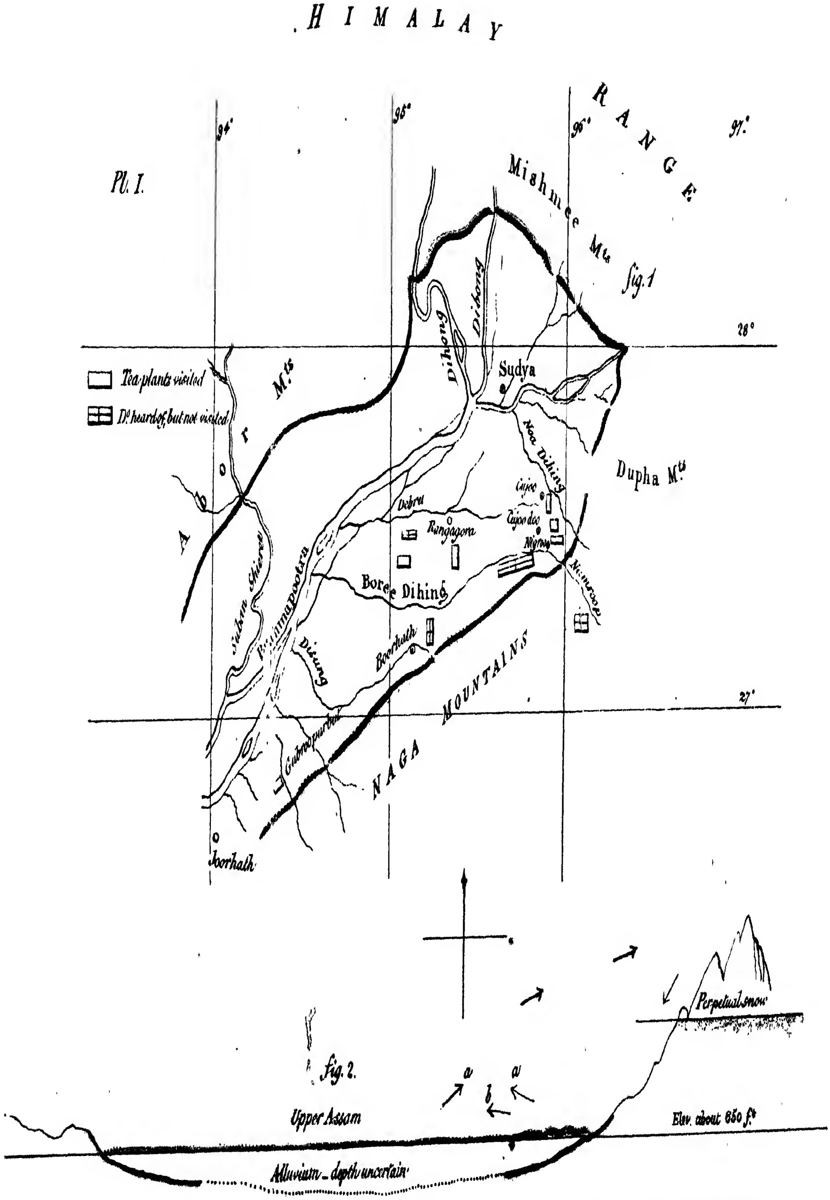

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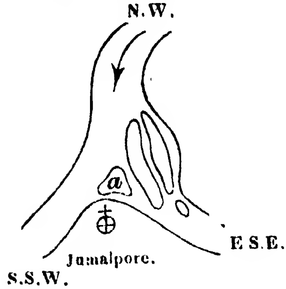
I.—*Report on the Physical Condition of the Assam Tea Plant, with reference to Geological Structure, Soils, and Climate. By* JOHN M'CLELLAND, *Esq. Assistant Surgeon, Bengal Establishment, and Member of the Asiatic and Medical Societies of Calcutta.—Presented to the Agricultural Society of Calcutta, 8th February,* 1837, *by desire of the Right Honourable Lord* AUCKLAND, *Governor General of India, &c. &c. &c.*

PART I.—*Geology.*

CROSSING the numerous rivers from the Ganges to the Bramaputra, at Jumalpore, we observed to the eastward an insulated tract of high land, between the towns of Moodapore and Pueculoe. It is laid down on the map of Bengal, as midway between Jumalpore and Dacca. This elevated tract, is, I have no doubt, an important geological feature; and I regretted that our duty did not allow of my remaining to examine it.

On approaching the Bramaputra near Jumalpore, I found the current had gradually forced its way through a yellow clay, or Kanka, that formerly controlled the course of the stream, directing it past the N.E. side of the high land above noticed. The aperture in the clay, however, which formed about twenty years ago, and is ever since progressively increasing, now allows three-fourths of the water of the Bramaputra to desert its former bed, and taking a new, or S.S.W course, at a right angle to the old

one, it joins the Ganges at a place called Seraj-gunge. As the enlargement of the new course progressed, the old one became more obstructed by sands at its entrance, as in the annexed diagram. The sinking of a boat at *a*, giving rise to accelerated accumulations, so that during six months of the year direct communication between Jumalpore and Dacca, (by what is still laid down on the most recent maps of Bengal, as the great channel of the Bramaputra) is quite obstructed. In its former course, the river was crossed near Mymensing by a bed of red clay or Kanka, penetrating from beneath the alluvium, and extended in a narrow belt from the Colibaree hills, to the insulated high land just adverted to, forming a direct communication between these two points. Whether the change in this part of the Bramaputra which is now taking place, be owing to a degradation of the country in the direction of its new course, or to a progressive elevation of its ancient bed, is an interesting subject for enquiry. For my own part I am inclined to think the latter the real cause, from the fact of the principal obstruction having appeared to be situated at the yellow clay; the deposition of sand at the entrance of the old channel, would thus appear as a consequence of the diminished velocity of the current from such alteration in the levels of the fundamental rocks as are now taking place in that vicinity.



Approaching the Kossia mountains, I observed small insulated knolls projecting abruptly out of the low marshy plains by which they are surrounded. They are seen extending along the base of the mountains as far as the eye can reach, and proved to be the remains of a former talus, from the fact of the summits of some of them being composed of course pebbles and boulders.

The acclivity of the Kossia mountains facing these knolls, may, without any great inaccuracy be divided into three stages. The first a rugged, but gentle slope to the height of about 1500 feet; the second precipices, and the third a succession of summits. Extending along the top of the first stage, and at the base of

the second, I found the well marked remains of a raised beach, characterised by a deposite of marine shells, twenty-five species of which, I have indentified with an equal number of species comprised in a small collection of fossils from the Paris Basin, presented to the Asiatic Society of Bengal by Mr. Christie. The smallness of Mr. Christie's collection, consisting only of about 150 species, prevents me at present from establishing perhaps, a much more extensive agreement between the tertiary remains of these two remote localities.

Descending at another point, ten miles to the westward of this situation, I found at about the same altitude, a continuation of the line of organic remains; but the fossils were here grouped together in distinct families, as is observed to be the case in the subappennine deposites. I have procured sufficient materials from these beds to enable me to establish their nature, as soon as I am provided with the means of comparing them with the fossils of other tertiary groups which have been examined in Europe.

Without dwelling farther at present on the geology of the Kossia mountains, I shall merely observe that their agricultural character appears to improve much after crossing the valley of the Boga-pany. Previous to that, the surface being composed of horizontal strata, is barren, and without soil except in ravines; but at Muflong, where the rocks become inclined, a fine rich soil is abundantly retained on their surface, while the ravines afford an iron sand, in more than sufficient quantity for all the purposes for which the metal is required in the neighbouring country; but the ore is not found in sufficient quantity to render it an object of that importance, which it otherwise would be, in the vicinity of such extensive repositories of coal as here occur.

Should it be thought desirable to give the tea plant a trial in the Kossia mountains, I would recommend a situation at the western extremity of the valley of Myrung, where the soil is derived from a granular foliated felspar, very similar to the rock that affords some of those tea soils, which have been collected in China.

But for the circumstances of the raised beach, as well as of the discoveries of the late Mr. Scott, at the Colibaree hills, Assam

would present itself as an instance of a great valley of denudation. This would also be supposed to be the case, if the mountains on the two opposite sides possessed any characters in common. Porphyry, primitive limestone, serpentine, granite, and talcose slates, compose the mountains on the northern side of the valley, while tertiary sand stones, shell lime stone, and coal, compose the southern group; in conjunction with metamorphosed gneiss, green stone, and syenite.

Here then we have two distinct systems, with the valley of Assam interposed between them. The valley contracts towards its outlet, to a breadth of only twenty miles in Lower Assam; but in Upper Assam, its breadth is probably fifty miles. In Lower Assam the breadth of the valley is still farther contracted by a small system of hills given off from the mountains on the south; through these hills, the Bramaputra flows with a pretty uniform current, at the rate of about three miles an hour.

At Gowahatti the Mekeer hills, as they are called, are composed of metamorphosed gneiss, consisting of quartz injected into felspar from below, and containing beds of mica. In other places syenite, also containing veins and masses of quartz occurs; and at Goalpara, hornblende, containing concretions of felspar, constitute the rocks in the immediate vicinity of the river.

At Noagong the rocks composing a portion of the Mekeers, called Solano, are of a magnesian nature, including lenticular masses of the size of large boulders, of granular and compact quartz, and pebbles of various kinds imbedded in a fine, curved, slaty matrix, and the whole arranged so as to represent the figure of an irregular volcanic cone; near which, in the open plain, an insulated accumulation of granitic masses form a mound of twenty or thirty feet high. Whether these granitic masses were propelled from below, or projected from a volcano, I had no means of determining during my hasty visit to the spot; but they possess no common character with the other rocks in the vicinity, that I saw.

Without entering farther into particulars at present, I think it will be conceded, that Assam is not a valley of denudation, and that the mountains on either side not only belong to perfectly distinct epochs, but that Lower Assam has itself been

subject to very considerable disturbances, the effect of which has been to raise the general level of this part of the surface, by which means the waters in the interior were confined for a short time, until the accumulation of silt obliterated the depression within.

Upper Assam, as may be expected from these views, is an extensive alluvial basin; regarding which, much depends on the accuracy of our general and particular observations, as it brings us at once to the main object of enquiry—the history of the tea plant and the circumstances in regard to soil under which it exists. (See Plate I, Figs. 1 and 2.)

In considering the extent and nature of this basin, we are at once struck with the peculiarity of a perfect plain about eighty miles long, and forty broad, surrounded by lofty mountains and invaded by four enormous rivers, beside six or seven smaller ones, the least of which is as large as the greatest river in England.

These streams are so many great channels, by which nature conveys into the valley, the productions of the mountains; and it is only necessary to mention the direction from whence a few of the principal streams are derived, in order to be prepared to find, in the natural history of this romantic and singular spot, a greater variety of objects than a similar extent of any less peculiar situation could be expected to afford.

The first of these great rivers is the Dihong, which enters the valley by a narrow defile in the Aboi mountains about twenty-five miles N.W. of Suddyah. Every circumstance seems combined to render the Dihong liable to sudden, or at least excessive periodical inundations, its hydrographical basin extending amidst snows, parallel to the equator from the 82° to the 98° of longitude, along the elevated plateau of the Himalaya.*

The first rise of this river takes place in the beginning of March, and amounts to about 15 feet, said to be occasioned by the melt-

* According to Malte Brun the peculiarity of the inundations of the Nile depends on its course being extended from east to west within the tropics. The inundations of such rivers are higher but less sudden than those of rivers running parallel to the meridian like the Suban-Shieree. See pages 6 and 7.

ing of the snow. Towards the middle of April, there is a general subsidence of about ten feet, and the river retains something more than its ordinary level, until the periodical rains set in, when the inundations commence, the river then begins to rise at Gowahatti, where it attains in July and August a height of 40 feet above its level during the dry season.

The second great branch of the Bramaputra—the Dibong, enters the valley by a similar defile to that of the Dihong. Between the defiles of these two rivers, which are not above fifteen miles apart, there is a remarkably abrupt and picturesque mountain, terminating in three peaks, on the highest of which snow lies for two thirds of the year. The source of the Dibong is unknown, but it must approach, if it does not pass within, the mountains on the frontier of China. It forms the natural boundary between the Abor, and the Mishmee tribes.

The third branch of the Bramaputra, is that which retains the name of the great river, from its falling straight into the axis of the main trunk, from the opposite, or eastern extremity of Assam. It enters the valley by a series of cascades, it is said, rather than by a deep defile : and indeed this peculiarity is distinguished at a distance of thirty miles, by the accumulations of rolled stones which have been propelled forward, causing a succession of rapids which gradually increase in number and difficulty. This river, after its entrance into the valley, receives the Digaroo and Kondul rivers from the Mishmee mountains on the north, and the Noa Dihing and Tenga from the south-east. For reasons to be afterwards assigned, it will be well to keep the direction of the two last named rivers in view.

The fourth great branch of the Bramaputra, called Suban-Shieree, takes its origin, it is supposed, in Thibet; and enters Assam from the north, below the junction of the other great branches, and at right angles with the great fluviatile trunk. From its southerly direction, and the peculiarity of its source in the snows of an elevated chain, from which it descends transversely, the inundations of this river take possession of Assam, previous to those of the other rivers. The silt which its floods convey into the valley, (where they spread and lose their im-

petuosity) is consequently deposited so as to impede the course of the Bramaputra. The great stream is thus caused to diverge from its direct course, and from time to time to force its way, by the bursting of new channels. Between two of these at present, an island, sixty miles long and ten broad, is formed at the confluence of the Suban-Shieree, chiefly by its silt.

It has now been shewn that Upper Assam is an alluvial basin, formed by the confluence of various great rivers, which flowing from opposite directions, meet in its centre. I have been unable to determine whether the original surface underwent any subsidence of its former levels, or whether the elevation of the rocks in Lower Assam was the only cause of the production of the basin. The total absence of any rocky protrusions through the alluvium, and the general levels relatively, between Upper and Lower Assam, as well as Bengal, being only such as to afford an ordinary current of about two miles or three an hour, indicate a depression of the older rocks in Upper Assam. More extensive observations, and experiments in boring, can alone determine this point.

The lowest deposite is a reddish yellow clay which lies in contact with the rocky masses in Lower Assam, forming the surface of that part of the country, but a short distance above Bishenath; this clay dips beneath the alluvial deposites and is seen no more.

The following deposites then succeed from below upwards; first, fine clays; second, sandy clay containing gravel; and thirdly, sand and gravel. These sedimentary deposites indicate in regard to motion three conditions of the water from which they were derived.

1. Stagnation;
2. Slow but general movement;
3. Active currents:

a series of effects, in every way illustrative of the interruption of the Bramaputra in Lower Assam, from the causes already described. A brief description of each deposite will now be necessary.

All rocky protrusions from beneath the soil, as well as the red

clay which forms the surface of Lower Assam, disappears about twenty or thirty miles above Bishenath, and from a hilly, or what in other countries would be called a mountainous character, the surface becomes uniformly flat. *The first change of structure that becomes apparent is in the red sandy clay, becoming intermixed in streaks with a white or light yellow plastic clay; similar to what is found at Jumalpore, on the northern side of Bengal,* reposing also on the red clay of that district. In both situations I found this clay perforated by small empty cavities from which the stems of monocotyledonous plants have been removed by decomposition.

To this a blue plastic clay succeeds, and both are seen in contact in the bed of the Bramaputra opposite to Joorhath, where the blue clay is used for the manufacture of coarse pottery; after being burned it becomes white, indicating the vegetable nature of its colouring matter, and the absence of iron. I searched as diligently as I could, but without success, to discover the character of its fossil contents.

The third deposite consists of sand and light coloured clays, alternating; and is either clay, sand, gravel or boulders according to the peculiar influence of currents in the waters from which it was derived. It is this deposite that determines, as far as soils are concerned, the peculiar character of vegetation in Upper Assam, and it is therefore entitled to careful notice in this report.

In the northern side of the basin, *i. e.* in the direction of the defiles of the Dihong and Dibong, I have had no opportunity of making enquiries; but from analogy I suspect the finer sands and clays are more rare in this, than in the opposite side of the basin, and from the circumstance recorded in Captain Wilcox's report, (*Asiat. Res.* vol. xvii.) of both those great rivers being navigable to canoes for some distance within the mountains, we have no reason to expect either a gravelly or a clayey soil in this direction, but rather, an uniform sandy structure mixed with vegetable matter.

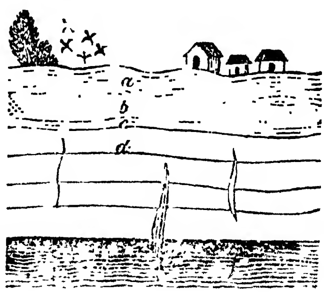
On the eastern side of the valley the case is different, and, as already observed, the impetus with which the third great branch of the Bramaputra falls from the mountains, has propelled to the

distance of thirty miles within the valley, an extended talus of boulders. With these exceptions there is a pretty general uniformity in the deposites of sand and clay, especially in the south side of the valley. I shall therefore only attempt a general systematic description, *and even this will not be found to apply exactly to every situation.*

A bed of gravel more or less deep reposes immediately on the surface of the blue clay. This is succeeded by sand, from fifteen to thirty feet deep, according to the place in which it may be examined. The lower portion of the sand is coarse, becoming gradually finer as it ascends in the bed, and passing into a yellow but light clay.

This clay, from the absence of plastic qualities, is easily distinguished from the yellow plastic clay which reposes beneath the blue clay. It is from five to fifteen feet deep in different situations, and is generally succeeded by a deposite of fine yellow sand which usually lies beneath the soil, or sometimes mixed with decomposed leaves, forms the surface.

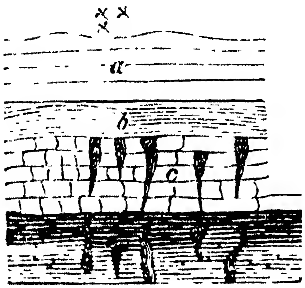
From this series there are the following deviations. Instead of a single bed of yellow clay, there are sometimes several smaller ones; alternating with sand. The sand beneath the yellow clay sometimes assumes the solid form of sand stone, and in many instances this change has more or less completely taken place.



At Rangagora, on the Debru river, the following section is exposed in the bank of the stream. *a* (in the annexed figure) is the superficial deposite, 8 feet deep; *b* is the river sand, coarse and cleanly washed; *c* is a thin layer of tenacious clay, the last from 2 to 5 feet deep; *d*, yellow sand 15 feet deep, containing small nodules of oxide of iron, pebbles of quartz and felspar.

On the Noa Dibing river, about ten miles from its junction

with the Bramaputra, the banks present the sand converted into stone, of sufficient consistence to resist, in bold rocky precipices and promontories, the encroachments of the stream. *a* (in the annexed figure) is the upper portion of the bank, composed of sand and clay, ten feet deep; *b*, bed of coarse sand, undergoing consolidation from below upwards: *c*, a deposite of sand altered into stone. One of the mountains on the southern side of the valley, at Gubru-purbut (Plate IV. Fig. 2.) which we ascended to the height of about 1000 feet,



presented low branching hills, extended from its base into the alluvial basin, composed of consolidated sand, similar to that on the banks of the Noa Dihing: and containing fossil trees (*Coniferæ*) at the height of 300 above the valley, and similar in their nature to the recent trees, now carried down from the Mishme and Abor mountains during floods and deposited in the sands: so that it may be a just inference to suppose that the sand stone composing the base of the mountain alluded to, was formed in the lower levels of the valley, precisely as that on the Noa Dihing is now forming: and when consolidated sufficiently to bear the shock, raised to its present position. It rests upon slate-clay, passing into limestone of marine origin; which rocks have been also uplifted with the former from below.

The last section of the sand, which I shall notice, is exposed by the Maum-moo river, in the vicinity of the tea colony of Nigroo (Plate II.) The first stratum from the surface, is composed of yellow sandy clay, covered with light sandy soil, next below is sand containing quartzose and other pebbles. The sand increases in coarseness, and coherency, the lower it is observed in the bed: and the lower portion reposing on the blue clay, is so completely consolidated as to require considerable force to break it with the hammer. One continued spring is seen extending along the lowest layer of sand, where unable to percolate through the blue clay, the water is retained in contact with the sand repos-

ing on the latter: to which it communicates a portion of the carbonate of iron which I found by analysis it contains, and which it derives from particles of the oxide of that metal in the sand. When the lower stratum of sand becomes perfectly consolidated and loses its porosity, superincumbent layers in succession are then exposed to the same influence. Nor are these changes less interesting when considered with reference to the tea plant and agriculture in general, than they are to geology.

The superficial yellow clay, already adverted to, presents to the naked eye minute white grains imbedded in a matrix of brittle clay; but under the microscope, the whole appears to be composed of sand. It is incapable of being rolled or moulded into shapes, and is finer or coarser, according to the place in which it is found, but its most important peculiarity consists in allowing water to percolate through its texture, and descend into the deep bed of sand beneath.

Superficial sand. This reposes on the last described clay, and under the soil. It may be supposed to be the effect of local currents, but it is often found in situations to which local inundations could not reach: as for instance at Rangagora, and in lower places this sandy deposite is often either carried away, or covered by a stratum of mud. Although this sand is usually pale yellow, or grey coloured, yet it changes greatly in this respect, and where it abounds in iron, and the subjacent stratum at the same time, is sufficiently impervious to cause a due proportion of moisture to be retained, so as to operate uniformly on the particles of metal; the colour of the sand, as well as of the substratum is red, more rarely the same colour is communicated also to the soil.

The description I have gone into regarding the structure of Upper Assam, will enable us the better to enter upon the consideration of soils; but first it is necessary to make a remark on the nature of certain changes to which the surface is exposed.

The rivers as they fall into the valley, precipitate such portion of their contents as their waters from diminished velocity are unable to convey further. This has occasioned a succession of low rounded sand hills, which are particularly to be observed on the south eastern side of Assam, at the tea localities of Cuju, and

Nigroo, where from the rapidity with which the Noa Dihing and Bora Dihing, fall into the valley, such accumulations are most to be expected.

There is consequently a general inclination of the surface, in this direction, extending from the main fluviatile trunk, to the foot of the mountains. Along this descent, the Debru, Bora Dihing and Disung rivers flow in very indolent currents from the S.E. where they take their rise, except the first, in the Naga mountains. If we add to these rivers a small stream which rises in a southerly direction, in the same mountains near Gubru-purbut, we have an accurate definition of the limits of the tea plant in Upper Assam.

Cuju, one of the places in which we found the tea plant, is situated at the source of the Debru; Tingrai, another tea locality, is on the bank of one of its tributaries; and Noadwar, a third situation at which we found the plant, is in a tract subject to the inundations of the same river; and we heard of its existence at Cherrabie, in still closer connexion with this stream.

At the source of one of the tributaries of the Bora Dihing, we examined the tea plant near the village of Nigroo; and heard of its existence at the extreme branch of that river, in hills twenty miles south east of Nigroo.*

We have also positive information of the existence of the plant, at Borhath, near the foot of the Naga mountains, and close to the source of the Disung; but circumstances prevented our visiting either of the three last mentioned places.†

Of the different streams just noticed, whose banks afford localities of the tea plant, the Debru, if not the most interesting, is at least the one with which we are best acquainted. It rises in the sand hills, or undulating country between the Bora Dihing, and Noa Dihing rivers, and derives its first waters from springs situated between the sand and clay deposites. The stream is languid, and not such as to indicate any great difference of level

* The colony of plants alluded to is situated at Namroop, many of our attendants had been there and saw the plant.

† For the situation of these tea colonies, see Plate I.

throughout its course, which is about sixty miles in a N.W. direction, but its banks near its source are from twenty to thirty feet high, and the surrounding country is dry, while the very reverse obtains in the middle of its course, and from thence to its confluence with the Bramaputra.

It passes through some of the best rice countries in Upper Assam, although the sandy nature of the soil would not impress an agriculturist with very favourable notions of its suitability for the cultivation of this grain.

The best grounds for rice, are those in which the yellow clay approaches the surface; but where this is not the case, the loose soil is submitted to a process of irrigation, by which its texture is quite altered. This is done by levelling, and exposing the new surface to submersion, either once or repeatedly, for a longer or a shorter time, according to the degree of alteration to be effected. The treading of cattle, and of the labourers employed in the occupation, and the decomposition of vegetables, tend to alter the character of the new soil, and to render it compact and impervious.

Those spots which form the centre of undulations too high to be levelled, or submersed, form convenient sites for villages, and for the growth of opium the second, and almost the only other object of cultivation.

I observed in this district, that where there is a sufficient command of water, which is generally the case, the driest, and most sandy surfaces may be converted into rice ground, either by causing a deposite of mud upon the surface, where the depth of sand is great, or by the infiltration of the finer particles of loosened soil, which are held in suspension, until deposited, or retained, by the sandy soils through which the waters are allowed to percolate.

Ascending the Bramaputra, I observed many instances of the rapidity with which wastes, composed entirely of sand, newly washed forward by the current during floods, become converted into rich pasture; and this too, independent of any subjacent impervious structure. As the freshes begin to lessen, and retire into deeper channels, the currents form natural embankments

on their edges, preventing the return of a small portion of water, which is thus left extended over the sands. These last already saturated, have little capacity for more fluid; that on the surface remains stagnant; and exposed to the action of a tropical sun, slowly evaporates, leaving a thin impervious crust of animal and vegetable matter. This impregnated with the seeds of *Saccharum spontaneum*, and other grasses, that have been partly transmitted by the winds, and partly left behind by the waters, derives sufficient moisture from the mists and dews so prevalent along the Bramaputra during the nights and mornings, to form a non-conducting medium sufficient to protect the germs from the scorching heat to which they would be otherwise exposed in the naked sand. Numerous flocks of aquatic birds frequent such places for fish, and molluscs, on which they feed; and as vegetation begins to appear, herds of elephants and wild buffaloes are attracted by the plentiful supply of food, and the retirement such places afford; and contribute to manure and form the new soil.

During the few excursions we made into the interior, I found other transformations of the original surface of the country, referrible to artificial, rather than to natural causes: such for instance as extensive embankments, raised as fortifications in remote times, when the resources and population of the country must have been in a far different state from what they are in at present. But the remains, in Upper Assam, of such works as are here alluded to, have an interest of another description in this enquiry, distinct from what they would afford to the antiquary.

When we find those artificial embankments, or tumuli, extending for miles through the most deserted tracts of Assam, raised often to the height of 20 or 30 feet above the plain, and overgrown with ancient forest trees, as large as those amidst which the colonies of wild tea plants are found, the question is at once suggested—" May not these colonies of wild tea plants, have been cultivated gardens, into which the plant was introduced artificially ?" A doubt would be thus cast at once upon the indigenous nature of the tea plant, and though it may have since propagated and grown spontaneously for ages, yet the chances

against its successful cultivation for commercial purposes would perhaps in consequence be increased.

Farther arguments might be adduced in support of this view, by referring to the antiquities of Assam; which are both extensive and decisive as to the former existence of such a state of society in regard to refinement, as would lead us to conclude that the luxuries of neighbouring countries, (and the tea plant among the rest) were probably artificially introduced.*

On the other hand, it may be observed in favour of the indigenous nature of the plant, in Upper Assam, that it is not found beyond the bounds of the alluvial basin ; so that we must ascribe to the latter, some natural influence to which we are indebted for the possession of this plant; as such restriction appears to me to be dependant only on natural causes, which do not alone affect this species, but also various others in both kingdoms of organic nature in like manner.

On reference to the map it will be seen that the plant is traced along the course of the small rivers which enter the valley from the south-east, in a series of distinct colonies; rendering it probable that the seeds have been transmitted forward along the course of the currents. It is not necessary that the seeds should have been conveyed at once down the current of any one of these streams from a great distance into the valley, or to suppose that their vegetative principle could survive submersion in a current for any length of time without injury. It

* At Teespore, near Bishenath, on an eminence by the river side, the surface to the extent of an acre is covered with architraves, cornices, pilasters, columns, and all the essential parts of a splendid building, carved in granite. The ornaments present a mixture of Saracenic and Roman styles. The stones do not agree in their nature with any of the rocks in the vicinity ; and from the way in which they are strewed, as well as from the freshness of their angles, would never appear to have been used. Temples of Hindoos are numerous, and about Gowahatti, some of them are very extensive and more elegant than I had previously seen in any part of India. Those that excel most in every respect are the most ancient, and are built of granite. Many of the insulated hills in Lower Assam have their masses sculptured in situ representing gigantic figures in bas-relief; and as such monuments are referred to Buddhists of early date, they prove, that the masses on which they have been marked, have undergone no general change in very recent times, although they do present some signs of the disturbing influence of earthquakes, which are said to be here frequent and severe.

is enough, that a single seed may have fallen from a Chinese caravan, near the source of one of those fluviatile ramifications which converge to the valley, on every side, over 18° Long. and 4° Lat., where it may have been deposited under circumstances favourable to its growth and propagation. A colony would thus be established, from which thousands of seeds might be annually transmitted, and although ten thousand of these might be lost, still one of them might be drifted during a flood along the banks of a stream, and deposited under circumstances favourable to the establishment of an advanced colony, and so on.

This view of the way in which the tea plant performed its migrations into Assam is not merely theoretical, as it occurred first from facts which were presented to me, during an examination of the tea colony at Tingrai, as will be afterwards shewn.

The next object is, to inquire whether we have any proof of the direction from whence the plant has been conveyed into the valley. It is necessary to call to mind that Assam is divided from east to west, by the Bramaputra; and that in the northern section of the valley thus formed, no tea colonies have hitherto been found, hence the plant would not appear to have been introduced from countries in that direction;* nor did Mr. GRIFFITH find any trace of it in the Mishmee mountains, or even that the Mishmee tribes have any knowledge of it whatever.† On the other hand, a Kamtee of rank, named Chi-long-fu, residing at Suddya, informed the Deputation that in all those countries to the eastward of Assam, tea is used at meals instead of water, and that during the hot season, it is the only drink of those who can afford to procure it—that it is drank at meals by people in good circumstances, and that the poor have it only at feasts, because they cannot procure it at other times. He also informed us, that it is by the common people of those countries with which he himself is connected, the general offering made to great men on visits of ceremony, when compliments are intended to be paid. It is cultivated, he says, in gardens; and plantations are reserved

* See Plate I. † Letter to the Tea Committee.

for the purpose of procuring it, and that the expense is equal to about one anna for two pounds weight. When preparing it for use this quantity is placed at once in a large vessel from which individuals of the party help themselves.

He farther assured us, that the tea thus universally used, is identically the same as the wild plant now growing in Assam, and that it is prepared by all the nations east of Suddya, with which he is acquainted, just in the way that it is now prepared by the Singphos, whom it was then supposed we were about to visit.

He said it was cultivated in gardens and plantations for convenience, and for the purpose of keeping up a sufficient supply, rather than from an idea of improving its quality beyond that of the wild tea plant. In their plantations, he informed us, they did not interfere with the growth of the tree, farther than by depriving it of the leaves for which it is cultivated. It consequently attains such a size as to oblige those who collect the leaves to climb upon the branches.

This is the substance of the information we derived from a person of weight, and some political influence at Suddya; but whether it is of much value in the elucidation of the question of the cultivation and manufacture of the Assam tea plant, I shall not at present venture an opinion: but this information, and certain physical indications regarding the direction from whence the plant originally approached the valley, are mutually in confirmation of each other. Thus we have still an extreme eastern depôt of plants at Namroop, the source of the Bora Dihing river. From this, Nigroo may have been directly supplied; but Cuju, as it presents the largest plants, I suspect to be the oldest colony of which we have any description, in the valley; and situated at the source of the Debru river, it is certainly the parent of all those colonies which have been discovered along the banks of that stream.

PART. II.—*Topography, Structure, and Soils of the Tea Colonies.*

The village of Cuju is situated about twelve miles from the banks of the Noa Dihing river, and twenty miles south of Suddya, in the midst of an extensive forest. It may be approached either by penetrating on elephants directly through the forest from Suddya, or by boats, as far as a spot on the banks of the Noa Dihing, called Cuju gât, from which a foot-path extends through the forest to the village. About half way there is a small settlement of Singphos, consisting of a few families, scarcely numerous enough to justify the term village being applied to their habitations. In their neighbourhood is a patch of ground a little lower than the adjoining forest, appropriated to the cultivation of rice. With this exception the forest is totally uninterrupted from the river to Cuju, where the rice grounds of that village extend over a space of about fifty acres, some two or three feet below the level of the general surface.

2. The soil of the rice field is in places rich, but superficial, reposing on a grey sandy clay; but generally it is itself grey and clayey. The soil in the forest is however light yellow, and of more sandy consistence than that of the rice grounds, but still of a somewhat clayey texture. We crossed a small stream, the water of which was coloured with what proved on analysis to be oxide of iron. The bed of the stream being sand, we may expect the same process of consolidation to be going on here, as has already been observed in regard to the Noa Dihing.*

The site of the village of Cuju, though surrounded by extensive forests, and scarcely elevated above the common level, is drier than any place I had previously seen in Upper Assam. The soil in the village, unlike that of the district generally, is of a rich brown colour, and affords good crops of opium.

3. The day after our arrival at Cuju, we set out to inspect the colony of tea plants, the first we had ever seen. We descended, soon after leaving the village, into a small depression,

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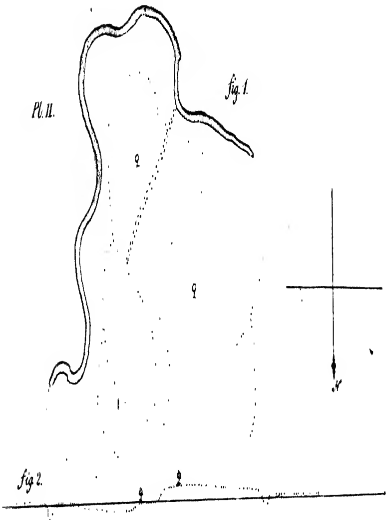
* See page 10.

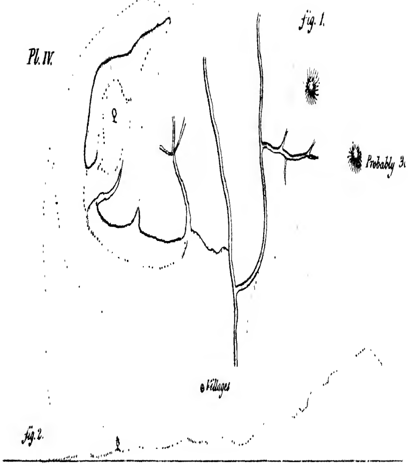
Pl. II.

fig. 1.



Map and Section of the surface of the Tea colony near the village of Nigroo.

Pl. IV.

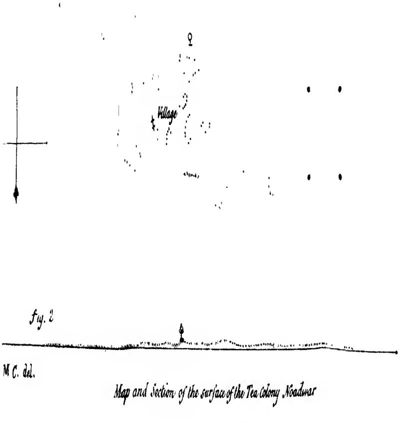


Map and Section of the Tea Colony at Gubroo Purbut at the northern foot of the Naga mountains.

fig. 1.

Light Blue, represents water
Green, Ponds, and occasional waters
♀ Tea plant.
N.B. different soils are represented by their respective colours.

Pl. III.

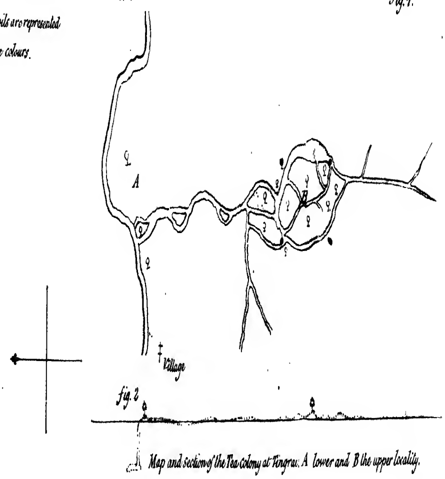


M. C. del.

Map and Section of the surface of the Tea Colony Noadwar

Pl. V.

Fig. 1.



Map and section of the Tea Colony at Tingrai: A lower and B the upper locality.

which had been cultivated for rice; proceeding about half a mile beyond this, we entered a thick forest, intersected by a small and nearly stagnant stream, the source of the Debru. The ground was somewhat more sandy, than that of the general surface which we had passed over. Pursuing a foot-path that had been recently formed, we came upon low sandy undulations, connected with the former windings of the stream we had just crossed. The sand in places was thrown up into mounds, the highest of which could not be more than twenty feet. After leaving these banks of sand, we had occasion to cross the stream again; we then entered upon level ground, the soil dark and firm under the feet, covered with grass and a few scattered trees. This was of short extent, as we suddenly entered the forest again and were surrounded by tea plants.

4. The first remarkable thing that presented itself here, was the peculiar irregularity of the surface; which in places was excavated into natural trenches, and in other situations raised into rounded accumulations at the roots, and trunks of trees, and clumps of bamboos, as in the annexed figure.* The excavations seemed as if they had been formed artificially, and were from two, to three, and even four feet deep, of very irregular shapes, and seldom communicating with each other. After many conjectures, I found the size of the excavations bear exact proportion to the size and height of the nearest adjoining trees, and that they never appeared immediately under the shade of large branches. The cause then appeared to be the collection of rain on the foliage of lofty trees; from which the water so collected is precipitated in heavy volumes on the loose and light soil, excavating it in the manner described.

5. The trenches are from one yard to ten in length, and generally a yard, or two yards wide; and their general figures correspond to the form of the interstices between the branches above. The tea plants are most numerous along the margins of these natural excavations, as well on the accumulations of dry soil

* In which the branches of the common trees are supposed to be removed in order to show the Tea plants

raised around the roots of bamboos. The soil is perfectly loose, and sinks under the feet with a certain degree of elasticity derived from dense meshes of succulent fibres, prolonged in every direction from various roots. Its colour is light grey, perfectly dry and dusty, although the surrounding country was still wet, from the effects of rain that had fallen for several days immediately prior to our visit.

6. Even the trenches were dry, and from their not communicating with each other, it seemed quite evident, that the soil and substratum must be highly porous, and different in this respect from the structure of the surrounding surface of the country.

Extending examinations farther, I found the peculiar character of the soil in regard to colour, consistency, and inequality of surface disappear, with the tea plant itself, beyond the extent of a circular space of about 300 yards in diameter.

7. It was also to be remarked here as well as in other situations in which the tea plant was afterwards examined, that insulated individuals were smaller in size, the farther they were found detached from the natural limits of the colony; which last were always found to be marked by certain changes in the soil, except perhaps in a single instance.* No. 978 is a specimen of the soil in which the tea plants were most abundant. No. 982 is that of the common soil of the district taken about 500 yards beyond the boundary of the colony.†

8. We now continued our journey along a path extending through the forest in the direction of W.S.W., occasionally approaching the banks of the Debru river. The soil in the forest, is similar to that already mentioned. Animals are very few, and consist chiefly of wild elephants; the forest indeed is too damp and shaded to afford a suitable shelter to the animals of Lower Assam, and of the plains of India; and the elephant is perhaps the only creature among the larger animals, who could procure sustenance in such a place. A new species of squir-

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* I here allude to the western boundary of the upper colony of plants at Tingrai. See page 28.

† For analyses of these soils, see page 29.

rel, (larger than *Sciurus maximus*) which I have named *S. bengmoricus*, seems to be peculiar to this tract. Towards the close of the first day's journey, we crossed a small clear stream running into the Debru on our right; and indicating an elevation of the surface towards the east.

9. We spent the night in a Singpho village called Cujudoo, and the following day we continued our journey through the forest in a southerly direction. Our path for perhaps five miles, extended along a massive embankment, probably thirty feet high, and overgrown with some of the most ancient trees in the forest. From this we pursued an easterly direction, and after descending from the tumulus, found a tree fern, which I believe proved to be of the same species as that which had been previously found at Cherra-punji. The surface soon became more elevated, and undulating; but still composed of yellow sandy clay. The streams then descended in an opposite, or N. E. direction, running we were told into a river called the Maun: while those we crossed in the early part of the day, run S.W. into the Debru, proving that we had crossed a tract of forest, elevated perhaps about 50 feet above the general plain, with a gradual, or almost imperceptible ascent, and descent, on each side, indicated only by the direction of the rivulets. We then crossed the bed of a small stream of clear water, passing over pipe clay; from thence the white, or yellow sandy clay, over which we had passed ever since we entered the forests, disappeared as well as all undulations; the surface assuming the ordinary character of flatness, to which we had been accustomed, and was chiefly composed of clayey soil, sometimes blue and in places yellow, but without sandy admixture. These appearances continued for a few miles, until we entered the village of Nigroo, on the banks of the Bora Dihing river. From thence we entered the bed of a small river which joins the Bora Dihing, called at this place the Maun-moo,* and proceeding up its bed, for the distance of about three miles, reached the second tea colony.

* *Moo*, or *Mokh*. mouth, synonymous with *Moon*, in Bengalee.

10. NIGROO.—The soils in which the plant is here found, are of three sorts, each of which differ from that in which it was found to grow at Cuju, but presenting points still more instructive and interesting than the latter colony afforded. The topography of the place, presents to our notice; First, the dry sandy bed of an occasional pond that empties itself by means of a deep drain (said to have been formed by nature, though it looks artificial,) extending across the colony of plants, and communicating with the bed of the Maun-moo. Secondly, a mound of tolerably rich, but very light soil, extending in a north easterly direction, and presenting a serpentine declivity to the S.E.

11. The Maun-moo river partly encircles the spot, giving it the shape of a small peninsula.* The level of the river is about 15 feet lower than the surface at the foot of the hillock, or mound, so that during floods the tea plants in the latter situation, must be liable occasionally, (I should think,) to slight inundation.

12. Approaching the spot, from the river, we crossed a zone of almost pure sand, overgrown with reeds, and in the course of a few paces, reached a sandy clayey soil in which we found a few small tea plants; a few steps farther introduced us to a drier, and less consistent soil, in which the plants were found larger, and more numerous. (I selected a specimen of each of these soils, marking the first, 1009; and the second, 1010.) Surrounded by tea plants, we ascended the mound, the soil of which is light, fine, and of yellow colour, having no sandy character. Here the plants were found still more numerous than in the lower ground.

13. I selected a specimen marked 1013, from the roots of various plants on the summit of the mound. I then descended and took a specimen (1011) from the roots of a large plant at the bottom of the mound; the two soils appeared to be quite different. We then traced the plants along the summit of the mound for about fifty yards, when they disappeared where the soil became dark. Now descending to the foot of the mound,

* See Plate II.

I found the tea plant there disappear, where the soil instead of being sandy or clayey, became rich and stiff, towards the bed of the pond; the last two specimens were numbered 1017, and 1018, consecutively.

14. On crossing the mound towards the N. W. the ground continued high to the river, which is not more than fifty paces distant; but the plants disappeared within twenty yards of the S.E. brow, the soil becoming grey and sandy—a fact which first suggested the idea, that where the drainage is more powerful on the summit of an elevation, the plant requires a different soil from that in which it flourishes in low ground, a view which subsequent observation, and analyses, tended rather to strengthen.*

15. NOADWAR.—The third tea colony we visited, is near the village of Noadwar, in the centre of Upper Assam, and not above twenty-five, or thirty miles from the Bramaputra.

Proceeding to the spot where the plants are found, we passed over rice grounds which were almost quite under water from the torrents of rain then falling, in the middle of February. Having entered the skirts of a forest which, though not under water, was wet and slippery, and in some places deeply covered with mud; we suddenly ascended from the dry bed of an occasional water course,† and at first sight discovered a total change of soil and vegetation.

From floundering in mud, we now stood on a light, red, dry, and dusty soil, (1176) notwithstanding the rain to which it was exposed, in common with every part of the country at the time.

16. This colony is probably about fifty yards in length and twenty in breadth, and extends along the S.W. brow of the dry channel: the height of the bank on which the tea grows is about five feet. The surrounding low ground is overgrown

* See XVI.

† Water courses, or what are called Beels, are common features in this part of the country, and are formed by the inundations of the Bramaputra, which, retiring rapidly, have excavated shallow channels in the alluvium to the depth of three or four feet, where the superficial yellow clay interrupts their farther progress. When not too low, they form good rice ground and pasture.

with reeds, and the higher tracts with forest trees. The surface on which the tea plants are growing is much indented, and excavated; for being loose, it is easily encroached upon, by accumulations of water when they take place in the channels. Thus situated on a loose and defenceless bank at the verge of a forest, this colony of tea plants may be considered as undergoing gradual obliteration from destruction of the surface, and there is reason to suppose that it has at one time been much more extensive than it is at present.*

17. The colour of the surface is dark yellowish brown, but on being opened it appears much brighter, and on sinking to the depth of three feet, it changes progressively to a deep, pure, orange-coloured sand, quite distinct from any of the other soils, or subsoils in this part of the district; and in this remarkable situation the tea plants are so numerous, that they constitute a third part, probably, of the entire vegetation of the spot. The red soil disappears gradually within the limit occupied by the tea plants. I observed the level of the waters in the wells in this neighbourhood, to be about ten feet below the surface of the ground.

18. GUBRU-PURBUT.—The fourth colony of tea plants we visited, is three days' journey E.S.E. of Joorhath, where the plant is found in a bright yellow, or red soil, on the lower extremity of a small range of gradually declining hills, extended about three miles from the Naga Mountains into the valley. The extent of ground which is covered by this group of plants, is about 60 yards in diameter, and of circular shape. The spot is raised about fifty feet above the plain, which is low, marshy, and covered with reeds on the northern and eastern side; but the low ground on the S.W., where a small valley is formed between the hill and the mountains, is cultivated with rice, and contains several villages; but at the immediate foot of the eminence on which the tea plants are situated, the ground is too low and subject to inundation, to admit of any sort of cultivation, so that this locality of the plant may be said to be surrounded by

* See Plate III.

inundated grounds on all sides except on the S.E., where the narrow chain of hills covered with forest, connects it with the Naga mountains.*

19. The general soil of this district is grey, and sandy, of clayey consistence; but the inner valley, which lies between the tea hill and the mountains, is generally covered with a rich brown soil, except in the rice fields, where its character is altered by irrigation. The soil in which these tea plants grow, is heavier and more compact than the tea soil of Noadwar; but in other respects it is much the same, and like that soil it is perfectly different and distinct from any other soils composing the surface in the neighbourhood. Extending from the centre towards the boundaries of the colony, the soil loses its peculiarities, and on the northern boundary becomes clayey, where the plant disappears. On the south it assumes a more sandy character, is loose and excavated by numerous small pits; the plant becoming stunted, gradually disappears where this change in the soil has taken place: thus indicating that this structure of soil, though exactly suited to the plant in the plain, as at Cuju, is not adapted to it on a hill.

20. On the eastern boundary, where the surface descends gradually towards the plain, and is perfectly loose and rather sandy, the plant grows luxuriantly. An excavation here, proved that the thin yellow soil degenerates beneath, into a pale greyish yellow sand; but in the centre of the colony, where the plants are crowded equally on every side, the colour of the soil brightens, on being opened, as it does at Noadwar, and changing from reddish yellow to the purest orange, it becomes more loose, as well as rougher when rubbed between the fingers the lower the excavation is made; characters which correspond exactly with the subsoil of Noadwar, the only difference being, that the surface is here consistent, and somewhat hard, while at Noadwar it is loose, although a variation in the state of the weather, may in some measure account for such differences.

21. Tingrai.—Tingrai, the fourth colony of tea plants we visited in Assam, (though I have here placed it fifth and last,) is

* See Plate IV.

calculated to afford some interesting observations regarding the natural history of this plant.*

The first peculiarity to be observed in the topography of the spot, is a small stagnant river formed in blue clay, about twenty or twenty-five feet below the general level of the plain, on the southern side of the stream, (if we may venture so to call it, under the view of its being stagnant only in dry weather,) where the tea plants are found; but the opposite side is a low delta covered with reeds.

22. The series of deposites composing the high bank on which the tea plants grow, is,

First, reddish yellow clay, four feet deep; denuded of its former soil by floods of surface water, which during heavy rains descend to the river. These waters have now however sunk a proper channel in the clay, which prevents their spreading during rains as formerly: but at the time of our visit the channel was perfectly dry.

Second, a deposite of coarse river sand, four feet deep, and similar to that described as forming a part of the section of the Debru.

Third, a bed of tenaceous clay, sometimes white, at others black, but generally slate coloured—two feet deep.

Fourth, a bed of yellow sand descending beneath the water in a perpendicular bank, partially consolidated, so as to appear like friable sandstone—an appearance however which is more conspicuous beyond the limit of the tea plants, than beneath the place they occupy.

The tea plants in the first of the foregoing series, are crowded together to the brink of the bank, as well as on every slight projection from the face of the precipice over the water, calculated to give them support; while the distance they extend towards the interior, is about thirty yards from the margin of the river. When raised by the spade, the soil in which they grow separates into loosely aggregated, clayey concretions, of reddish yellow colour, rather hard and dry.

23. Pursuing the channel which has been already mentioned,

* See Plate V.

(as grooved into the surface in which the plants are found, by the repeated action of currents from the interior during rain,) in the direction of its source for about a quarter of a mile, no tea plants appeared on either side beyond the distance of thirty yards from the river. Advancing a little more than a quarter of a mile, the channel begins to spread into numerous reticulated branches, with little intervening islets formed of naked sand and dry rubbish around clumps of bamboos, and trees that have taken such strong root as to resist the degradation of the surface, collecting these heaps from the waters during floods. Occasional small tea plants here begin to make their appearance, mounted upon these accumulations.

Proceeding farther, the tea plants became more numerous, and the number of the channels in the surface more multiplied, each however smaller, and the whole spread over a greater space, until we gradually found ourselves in another colony of tea plants, distinct from the former one.

Extending our enquiries up the course of the various channels, we found them all emanate from one; but beyond the point at which this separates in the manner described, I could not find a single tea plant.

24. The boundary of this colony, like that of the lower one, is abrupt and defined at that portion which is presented to the direction of the current; while the lower extremity presents a lingering train of straggling individuals extended along the direction of the stream, thus proving the migration of the plant in the course of the currents, from the upper to the lower colony.

Suspecting from these interesting facts, that both colonies were supplied from some more permanent and extensive location of tea plants, I pursued the extreme channel in the direction of its source; and in doing so, found that several smaller channels entered it from the S. E., indicating a gentle ascent of the surface in this direction, from whence probably the tea seeds were directed forward from some original depôt, to the places just examined.* Having proceeded about a mile into the interior

* The discovery of an additional colony of tea plants in this vicinity since it was visited by the deputation rather strengthens this view.

of the forest, I found my attendants who were boatmen, and not much accustomed to expose themselves, where the foot prints of tigers were so numerous, had thought it most prudent to return, and on finding myself alone, I followed their example without accomplishing the object in view.

25. The point at which we entered the forest of Tingrai, was not of itself calculated to afford a just prepossession as to the circumstances of the tea plant; for the first individuals we saw, presented themselves to us in a dark soil, but this ultimately proved to be but the western limit of the colony. In the same direction too, the forest had been cleared for cultivation, and imagination readily conceived it to have been covered by tea plants, an assumption for which neither the facts elicited during the examination of the place, nor those derived from previous enquiry, afforded any good reason to suppose correct. At the same time, the number of young plants we found in this soil, affords an encouraging instance of the disposition of the plant, to accommodate itself to any soil, as far at least as its vegetative powers are concerned. But crossing from this point, in order to determine the lateral extent of the colony, the illusion was exposed, and the plants were found to increase in size, and number, as we approached the light sandy soil composing the islets between the reticulated channels; disappearing again in a dark, rich, moist, soil, which formed a well defined limit to the colony on the eastern side of the channelled surface.

26. These observations apply merely to the upper colony; the lower one is distinguished from it by an interval of half a mile in which the plants are totally absent, and by a still greater interval in which a few delicate individuals are seen, whose seeds have been carried from the upper colony, thus far towards the lower one, by the currents of waters, as is evident from their growing in the accumulations of sand and drifted rubbish which form the irregular surface between the dry channels already mentioned. (23.)

27. The plants in the lower colony, grow in the yellow denuded clay already noticed, (22), but to which the office of a soil is communicated, by its peculiar position on the verge of a

steep high bank, and by its reposing on a deep bed of sand; two circumstances which render it dry and porous. Nodules composed of an earthy admixture with oxide of iron, were found plentifully in the dry channels, not uniformly distributed, but accumulated in places. Although the general colour of the soil composing the islets was grey; yet in places it presented a bright red appearance, either from the large proportion in which oxide of iron exists in those places, or from the different degree of oxidation to which it has been exposed.

Chemical Examination of the Assam Tea Soils.

No. 978. Soil from the roots of the tea plant at Cuju. Colour light grey, uniformly fine dusty sand, without consistency. Rubbed between the fingers it feels rough, is without smell; surface broken, undulating, excavated, dry and loose, uncovered with grasses, and apparently arid.

Constituent parts in 200.

Water,	37
Fresh fibres,	1
Vegetable matter,	$5\frac{1}{2}$
Silex	135
Alumina,	11
Oxide of iron,	$4\frac{3}{4}$
	$194\frac{1}{4}$

No. 982. Soil of the neighbourhood, taken about 500 yards beyond the boundary at which the tea plants disappear. Colour, greyish black; surface, covered with grasses, moist, uniform, firm and solid. When rubbed between the fingers this soil possesses considerable coherency and softness.

Constituent parts in 200.

Water.	52
Extractive matter,	5
Vegetable matter,	$8\frac{1}{2}$
Silex,	114
Alumina,	$9\frac{1}{2}$
Oxide of iron,.	4
	193

I. No. 978, is the soil of the spot to which the tea is confined. No. 982 is that which surrounds the tea soil, and to which, if it were not inimical to the plant, we might expect the latter would be extended. As Cuju presents some tea trees probably thirty or forty feet high, measuring eight or nine inches in the diameter of their trunks, at the height of eight or ten feet from the roots, we may look upon it as an established colony; and of much older date than any which we subsequently examined. The portion of the forest in which the tea plants occur, presents no deviation from the level of the general plain. There are here no perplexing features, in local peculiarities of aspect or elevation, such as most of the other localities present. It therefore becomes necessary to compare the results of the analyses of the two soils, which appear to exercise so marked an influence on the main object of this inquiry.

II. Soils have been usually prepared for analysis, by exposing them to the air until they become moderately dry, disregarding the quantity of water they lose in the process. I have endeavoured on this occasion, to apply analysis to the different soils in the condition in which they occur in nature, where all is diversity, and no standard of exposure to evaporation from the surface, and filtering properties of subsoils is recognised.

III. The fineness and solidity of a soil, renders it less exposed to lose its excess of water by evaporation, than if it possessed a lighter texture. The pervious or impervious nature of subjacent beds; whether clays, sands, or continuous rocky masses; the depth of these from the surface, and their inclination with the horizon, are so many modifying principles of the nature and fertility of soils; chiefly however, from their operations in promoting, or restraining, the gravitation and evaporation of moisture from the surface.

IV. Such water as depends on peculiarities of the latter description I have denominated *free;* in contradistinction to that which depends on the nature of the soil itself, or what is commonly called water of absorption. Although the free water of any soil, will differ with the season, and with the state of the weather; yet if a few dry days be allowed to precede the selec-

tion of specimens, the uniformity in regard to the free water will be much more than might be expected.

V. In the present instance, the object was for the most part to discover what distinction exists between tea soils, and adjacent common soils; and for such comparative purpose, it was not necessary, nor did the circumstances of the journey allow me to observe any choice of weather, such as would have been desirable for the selection of specimens for a more abstract mode of inquiry; it being convenient, merely to select those specimens which it was intended to compare with each other, under equal circumstances with regard to rain, and other causes calculated to influence their moisture, independent of the structure of the soil itself, and of the beds on which it rests.

VI. In order to show the necessity of proceeding on these principles, it is only necessary to state, that I found the two soils of Cuju, after having been exposed equally to the air of a room, differ very little in regard to moisture; although in the state in which they exist in nature, the tea soil contained only 18½ per cent. while the common soil contained 26 per cent. of water; yet both were taken within 500 yards of each other, on the surface of the same plain.

VII. The following explanation will account for this phenomenon, as well as for the other differences which analyses have detected between these two soils. An impervious bed of clay at an uncertain depth, interrupts the percolation of water; or in the absence of such bed, sands themselves containing particles of iron, become consolidated, infiltration is obstructed, and the surface, from having been arid, becomes moist. Vegetation then takes place, and the soil becomes bound with the roots of a succession of plants, which die, and form new constituents to its fertility.

VIII. Thus we can account for the black soil surrounding the spot on which the tea grows at Cuju, and the explanation suggests an opposite train of circumstances to account for the peculiarities of the soil and situation occupied by the tea plants, depending merely on the facility with which water is allowed to descend from the surface.

IX. Having thus determined the advantage of examining soils in the state in which they occur in nature, rather than in an artificial state to which they may be reduced by drying; it became necessary to separate free water from water of absorption. The first was estimated by the loss of weight sustained by exposing the soil to the temperature of boiling water; and the second, by the farther loss of weight occasioned by heating the soil in the ordinary way; but in the analysis of the two soils under consideration, this distinction was not made; and in the others, it would have been more accurate to have estimated the free water, as a physical property rather than a chemical constituent.

X. The Cuju tea soil, (976) contains 7 per cent. less water than that soil in which the plant does not grow. (982.) It contains $3\frac{1}{4}$ per cent. vegetable matter, in the state of dry woody fibres and impalpable powder; whereas the common soil, (982) contains $6\frac{1}{4}$ per cent. vegetable matter; but of this, a portion equal to about $2\frac{1}{2}$ per cent. of the soil is in the state of extractive matter. In the extractive we perceive the effects of excessive saturation, (VI. VII.) and it operates by affording coherency and solidity to the surface; while the remaining $3\frac{3}{4}$ per cent. of vegetable matters, united with the extractive, assists in retaining moisture at the surface, beneath which a putrefactive process must necessarily be taking place, in consequence of which the soil is rendered black.

XI. With respect to silex, which next to water is the principal constituent of these soils, (982) contains nearly 5 per cent. less than the tea soil. We find the extractive chiefly occupying the place of this deficiency of silex in the volume of the soil; for although there is a displacement of alumina, equal to about $\frac{1}{300}$ part of the soil, and of oxide of iron equal to $\frac{1}{800}$ part; yet it is not to such slight variation that we can ascribe the remarkable distinctions observed towards them by different forms of vegetation; and there is happily no necessity for rejecting those more obvious distinctions, which display themselves in the colour, consistence and moisture of soils, for the mysterious influence of minute chemical agents.

XII. It may, I think, be received as an axiom, that tea soils

differ from ordinary soils, and agree amongst themselves in retaining their mineral characters (whether derived from an oxide of iron, or from a peculiar sand) tolerably free from the discolouration of organic admixtures in a moist state.

XIII. Thus we find the plant disappears, on approaching the black soil at Cuju. It also disappears on the top of the mound at Nigroo, on approaching a similar black soil. This is also observed to be the case, on approaching the dark rich soil at the eastern extremity of the upper colony of Tingrai, whatever doubt there may be regarding the western boundary of that colony; and at Noadwar, the plant disappears on all sides where the soil degenerates from a clear yellow, to a brown or black colour, just as it does at Cuju.

XIV. An interesting observation resulting from these analyses is, that the vegetable matter in tea soils acts only as an absorbent of moisture, as appears from the fact, that where vegetable matter is greatest, alumina, the common absorbent principle of soils is least, all other circumstances being the same, and vice versa. Thus in the tea soil of Cuju, in which we have only $2\frac{3}{4}$ per cent. of vegetable matter, exclusive of a slight portion of recent fibres, we have $5\frac{1}{2}$ per cent. of alumina; but where vegetable matter amounts to 8 per cent. as in 1011, we find $3\frac{1}{4}$ per cent. of alumina.

XV. It is clear from these facts, that vegetable matters are not inimical to the tea plant, so long as they are not in a decomposed or decomposing state; that is, in general, so long as they do not discolour the soil, but exist in some degree as extraneous matters, or mechanical, rather than chemical agents, implying no other property than that the soil should be dry. It will be seen, however, in a subsequent part of this report, that under the peculiar climate of the tea plant, the requisite quality of the soil just noticed, must naturally be of rare occurrence; which will account for the manner in which the plant is distributed in spots, or distinct colonies, instead of being uniformly diffused with the common vegetation.

XVI. The two tea soils in which alumina abounds most, 1183 and 1013, are those of Gubru-purbut, and the summit of the

mound at Tingrai. In the one case the soil is raised 30, and in the other 20 feet above the level of the valley; in each the quantity of alumina is in proportion to the degree of insulation of the soil in regard to moisture, and the greater drainage to which it is exposed. In the one case the alumina amounts to 9, and in the other to 8 per cent.; although in no case where the plant is found on the plain, does the alumina in the soil amount to more than 6 per cent.; and seldom to above 4½ per cent. The narrowest inference we can draw from this is, that the same soil would not be suitable to the plant in every situation.

XVII. The last common constituent in these soils to be noticed is iron. The colour of soils affords a bad criterion of the proportion in which iron exists in them. Thus 1183 contains only 3 per cent of the oxide, yet it is of much brighter colour than 1009, which contains 6 per cent. Indeed the latter is only a pale greyish yellow, while the former approaches to orange. This may be owing to the metal being less oxidized, and also to the soil containing less vegetable matter in the one case, than in the other.

Without attaching any peculiar importance to the presence of iron in tea soils, much less to any particular form of the metal; yet the colour it generally imparts is likely to prove a valuable, though not an infallible guide in the selection of sites for plantations. Ferruginous colour whether it be yellow or orange, may be relied upon as characteristic of dry soils, tolerably exempt from chemical operations arising from organic impregnations which, under the high temperature and moist climates of tea countries are so likely to prevail. But light grey soils such as that of Cuju (978), as well as 1011 in the following series of analytical results are, under the circumstances in which they exist respectively, as salutary to the tea plant as any of the other soils examined.

28. From the foregoing enquiries it appears that the tea plant of Assam grows spontaneously under slightly distinct circumstances as follows.

1. In the level plain:—
2. On embankments or mounds somewhat raised above the

plain. Cuju, Noadwar and Tingrai are examples of the first, Nigroo and Gubru-purbut are examples of the second.

The first class of situations, are distinguished from the general plain, by a porous structure, and the peculiar character of maintaining a dry surface under exposure to excessive moisture; the second by a structure less porous than the first. In both, the plants are situated at the verge of inundations which prevail during the greater portion of the year on the adjoining lands.

The important peculiarity of these sites is, that they are less secure from inundation by their elevation than by their structure. Indeed the lower sites are scarcely raised more than a yard above the adjoining flat plains, which are exposed to inundations not merely during falls of rain, but also from the overflowings of the great rivers. But these circumstances, which are sources of fertility to the adjoining lands, appear to produce an opposite effect on the sites of the tea plant, thus causing the peculiar condition on which the presence of the plant in some measure depends. All soluble and subtile matters are prevented from accumulating in the soil of those sites, and are washed as it were from a filter into a loose sandy bottom—all vegetable and animal decompositions, and all chemical operations except the oxidation of particles of iron, are here prevented from taking place. Hence the characteristic colour of the generality of these soils already pointed out. Protected in Assam under the shade of dense forests and a gloomy and excessively humid atmosphere, (the latter the most indispensable of all conditions as I shall presently show,) the tea plant flourishes in its barren soil along the verge of rivers, lakes, and marshy lands.

Where the requisite porosity of structure is not afforded by subsoils, the defect may be overcome on the rounded summits of embankments, and on the declivities of small hills and undulations, such as those on which the plant appears to be cultivated in China:* and where these last are wanting artificial drains and trenches may be resorted to, either with the view of qualifying

* I shall have occasion to refer to authorities on this subject when considering the climate of the tea provinces.

an unfavourable soil for the reception of the plant in the first instance, or for supplying the want of suitable porosity.

In the more sandy rice districts, the small ridges which subdivide the fields may be increased in size, and each planted with a single row of tea plants, a practice which would seem to be followed in China although the erroneous notions hitherto entertained regarding the supposed mountain habit of the plant, prevented the example from having been before recommended.

There are however many spots of suitable structure in Upper Assam, that might be selected for new plantations; the most desirable might be at once chosen, while the old colonies should be carefully preserved for the supply of nurseries. This would seem to be the more necessary, as in case of the seed becoming exhausted by the injudicious treatment of the plants composing the original colonies, the difficulty that might arise in procuring a fresh stock from China might prove fatal to Assam as a tea province. From those tea seeds which were procured from China at an enormous expence to Government, few plants have been reared, and probably not one of those few will ever bear seed. The importance therefore of abstaining from officious interference with the original colonies must be evident. None of them are very great in extent, and it is possible to conceive that as they are all in retired forests some attempts may be directed to the transplantation of the trees in a more convenient but less appropriate situation, (as is almost sure to happen on such occasions if *convenience* be at all allowed to enter into our views) and thus exhaust, if not totally destroy the means of conducting more judicious experiments.

Little is to be expected from any attempts that can at present be made to manufacture tea from the uncultivated plant: but still as there is a small establishment on the spot for the purpose, consisting partly of Chinese, they might be employed in constant trials upon the leaves afforded by the different colonies in order to detect what the nature and degree of difference may be, between the products of the different soils as well as of leaves of different size. The mode of manipulation adopted with regard to each specimen, and how diversified, should be carefully noted,

and reports upon the subject forwarded to Calcutta by the person in charge; together with specimens of the prepared tea packed in leaden boxes containing those aromatics upon which some of the finer qualities of teas may depend.

Further observations may be derived from the following descriptions. The specimens of these and various other soils which are in possession of the Tea Committee may be submitted to a more elaborate analysis if necessary.

Soil No. 1009 (See Sec. 12, page 22.) Colour yellowish grey, structure intermediate between sand and clay, both being irregularly intermixed, the latter forming the matrix to the former. These parts are not uniformly blended, but the more clayey parts form nodular lumps surrounded by others of more sandy consistence. Tea plants few, of the first year's growth and sickly.

Constituents in 200 parts.

Free water,	20½
Water of absorption,	15
Vegetable matter,	11
Oxide of iron,	11
Alumina,	12
Silex in the state of fine dusty sand,	127
	196½

Soil No. 1010. Light brown colour, soft and fine, when rubbed in the fingers, without any tendency to clay or sand; surface undulating and higher than that of the last soil. Tea plants more numerous.

Constituent parts in 200.

Free water,	23
Water of absorption,	23½
Oxide of iron,	6
Vegetable matter,	11
Alumina,	9
Silex, fine and dusty,	122
	194½

Soil No. 1011, from the foot of the mound, Tingrai. (See Sec. 13. page 22.) It is a loose grey sandy soil containing particles of mica, and

appears to be the same as 1009, but subject to the action of the water from the mound percolating through it as a filter. The specimen was selected from the roots of a large tea plant, but smaller plants are numerous, healthy and flourishing in it.

200 parts afford

Free water,	22½
Water of absorption,	3
Vegetable matter,	16
Oxide of iron,	6
Alumina,	6½
Silex in the state of coarse sharp sand and dusty matter.	130
	194

Soil No. 1013, from the top of the mound Tingrai, (See Sec. 13. page 22.) Colour yellow; substance light and dry; soft when rubbed in the fingers. Structure very loose, abounding in reticulate fibrous roots which cause the surface to yield under the feet. Upper surface to the depth of an inch covered with dried leaves and other loose vegetable matters. Tea plants very numerous, that is to say, a plant occurs in every three square yards at least.

Constituents in 200 parts.

Free water,	26
Water of absorption,	20½
Corbonate of lime ?	1
Vegetable matter,	9½
Oxide of iron,	9
Alumina,	16
Silex in the state of impalpable powder.	114
	197

Soil, No. 1176. Noadwar soil. See Sec. 15, page 23.

200 parts yield

Free water,	25
Water of absorption,	19¾
Oxide of iron,	13
Vegetable matter,	8½
Alumina,	9½
Silex,	120¼
	196

Soil, No. 1183. Gubru-purbut. See Sec. 20. page 25.

200 parts yield

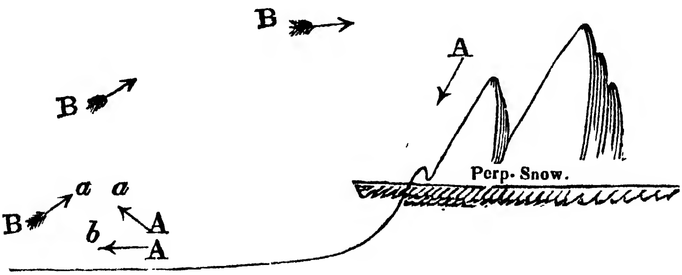
Free water,	23
Water of absorption,	10
Vegetable matter,	9
Alumina,	18
Oxide of iron,	6
Lime,	1
Silex,	132
	199

Note.—The water of absorption in this last soil, appears to be less than the quantity of alumina in it compared with that of the other soils would lead one to conclude. But the method adopted to distinguish between the watery part was very imperfect. The standard of boiling water was resorted to in preference to slow exposure to the atmosphere in consequence of the absorbent power of air differing so much in India in different seasons, and these analyses were made during the rains.

Part III.—*Climate.*

29. The wind in Assam is N.E. at all seasons, and the whole valley lies in the direction of its current. Descending from the Himalaya the air derives an impetus from its low temperature, and consequent greater specific gravity than the heated westerly wind. It is not meant that the air in the upper atmosphere in contact with the snow is heavier than the lower strata in the valley, which would be contrary to certain well known laws; but merely that the air in the vicinity of the mountains above the line of congelation, is rendered specifically heavier than the general air of the same altitude, in consequence of the heat absorbed from it by the snow. It consequently sinks, causing a motion in the warmer air to occupy its place. Thus an upper current is formed while the lower one descends into the valley where its diminished temperature renders it sufficient to overcome the heated land winds which enter from the west, by the great defile of the Bramaputra.

The annexed diagram will render these phenomena better understood than mere description.



The three arrows AAA represent the local current, and BBB the exhausted S.W. wind as it arrives from the open plains of Bengal.* The mountains on the northern and southern sides of the valley, and the irregular accumulation of vapour must produce a corresponding variation of the currents near the surface of the valley at *b*, the situation at which the opposite forces are supposed to meet. This point will vary of course according to the relative intensity of the t● currents.

30. During those months when the westerly winds have greatest power, and the influence of opposing currents from the N.E. extremity of the valley most diminished, in consequence of the disappearance of a larger proportion of snow in that direction; the westerly winds then extend with lessening temperature and velocity as high as Bishenath in Middle Assam, beyond which they are seldom known to reach; nor is their power even there sufficient to overcome the influence of the N.E. current, more than for a few days at a time during the hottest days of April and May.

Throughout the cold season, dense vapours arise from the Bramaputra about day-light, and continue to increase until 8 A. M. when they begin slowly to ascend. They are then drifted before the N. E. wind, which from the diminished heat of the valley now amounts only to a gentle movement, the direotion of which is

* See Fig. 2. Plate I.

modified by the action of the sun's rays on the upper stratum of mist, causing a more or less powerful dissipation, and exciting a movement in the general mass towards the side on which this action is taking place. The whole of the vapours are thus attracted towards the south, where unless entirely dispersed by noon, their broken masses linger on the northern face of the Naga mountains, receiving daily fresh accumulations, until they are precipitated in heavy rain, seldom however before they have served as an impenetrable canopy to this side of the valley for several weeks.

This tendency of the mists to occupy the south side of the valley, is an interesting point if considered with reference to what I have already stated regarding the absence of the tea plant on the northern side.*

The plains on the northern side of the Bramaputra, may indeed be considered generally to enjoy two hours more sunshine daily, during the cold season than those on the south, a circumstance which is of itself calculated to influence vegetation, and cause a difference in this respect between the two sides of the valley.

31. With regard to the cause of these mists, it would be easy to say that they arise from the moisture of the forests ; but if this were all, they should appear after sun-set when the heat of the day is first withdrawn; the loss of temperature would then cause a condensation in the lower atmosphere, which is not the case in Assam ; nor do the mists first make their appearance in the forests, but on the river, and on such parts of it as are shallowest and most languid in current.

I attended as closely as I could without neglecting other equally important matters, to these peculiar phenomena, and the only conclusion I could come to from the observation of simple facts was, that they arose from the difference of temperature between the water of the Bramaputra and the air, which amounted to a mean difference of 15° Fahr. during the month of December. Throughout that month, in our progress up the river from Gowahatti to Suddya, I found the water at sun-rise vary

* See page 16 ; also Fig. 1, Plate I.

from 55° to 56° Fahr. and the temperature of the air at the same time, from 38° to 42° Fahr. This difference causes the water to give off more vapour than the air can hold suspended in an invisible form; partial condensation immediately ensues, and the sensible vapour is then seen curling over every portion of the river, just as steam presents itself to view ascending from the surface of heated wa

32. Those high altitudes by which Assam is surrounded, occasion a rapid abstraction of heat during the nights of the cold season, in which the waters and the air participate unequally, as conductors of different powers. The latter consequently retains a higher mean temperature than the former, and assists during the cold season to check excessive diurnal variations. On the other hand, in the hot season, when the radiation of heat from extensive wastes of sand is prevented by the freshes which cover them, and the volume of water increased, as well as the rapidity of the rivers by the melting of the snow; the rivers then present a temperature much beneath that of the atmosphere whose heat they now contribute to lessen, just as they promoted an opposite effect during the cold season. Nor is this influence of large bodies of water upon climate confined to Assam; it applies equally to all great valleys similarly situated, and especially to those inland provinces of China whose productions are so similar.

From what I could learn regarding the temperature of the hot season, it would appear that 82° Fahr. at Suddya, is considered as excessive as 96° in Calcutta; and although the quantity of rain that falls during the year may be supposed from a combination of circumstances, to be much in excess of what falls in Bengal, yet there is reason to suppose that during the months of July, August, and September, the quantity in Assam may be no greater then elsewhere; the absence of any season of perfect drought being the peculiar feature of the climate. If however the theory by which I have endeavoured to account for the peculiarity of wind, during the S.W. monsoon be correct, it is difficult to

conceive that clouds and showers should not be frequent, or at least occasional during the months of April and May.*

33. From these general observations on the climate of Assam, we may venture to infer that in regard to heat and moisture, it possesses many peculiarities when compared with the open plains of Bengal.

Looking down from the Kossia mountains into the valley, in November, it presented the appearance of one vast lake, from the sheet of vapour under which it was concealed for several hours daily.† While ascending the Bramaputra in December, the weather was generally dark and gloomy with some rain. During the time we were in the forests, which embraced the greater portion of January, we seldom saw the sun; and the early part of the month was chiefly wet. February, and until the middle of March, was generally wet; nor have I often witnessed even during the regular rainy season, heavier or much more frequent falls of rain than took place in Assam at this period. On the most moderate computation, I do not think we could reckon the quantity of rain that fell during the three months above mentioned, at less than 15 inches; yet during the same period in Calcutta, I find on reference to PRINSEP's Journal, that only 2 inches of rain fell—one shower only having taken place in December, January being dry throughout, and February affording but two days on which any rain whatever fell.

Note.—The following, which is all I can say on the subject, may afford some elucidation of the climate during the hot season resulting from the collision of the S. W. monsoon with the local N.E. current in Upper Assam.

* On two winds of different temperatures and differently saturated coming into contact, the result would be the formation of a cloud or the precipitation of rain according to the proportion of moisture contained in the warmer vapour. See PROUT's *Bridgewater Treatise*, 292.

† This was sometimes observed even for several days, and may be considered to have been actually the case during the greater part of the two following months, but being then in the valley we could not perceive it otherwise than by the shade. The effects of these clouds upon vegetation, and in checking extremes of temperature, may be conceived from the circumstance that when they were first observed from the Kossia mountains, a keen N.E. wind blew daily, and from which the valley was quite protected by the vapour.

On the morning of the 22d March, a severe storm of thunder, wind and rain took place. It approached rapidly from the western horizon, which presented the most lurid aspect; yet at Noagong, about 30 miles east of Bishenath, (in the direction of the storm,) I afterwards learned it was the eastern horizon that presented the peculiar aspect observed at Bishenath in the west; so that the storm must have originated in the intermediate space, nor was its range on the east of Bishenath to all appearance more extensive. The weather continued cloudy till the 27th, and on the 29th another storm took place; on the 4th of April a third; but as I then finally quitted Assam, I had no farther opportunity of making observations.

Having now described the condition of the tea plants in Assam, it may be desirable to offer a few remarks upon their situation, compared with what is said by various authors to be the case of the plant in China.

34. If we take Kiang-nan and Kiang-si, as instances of two of the tea provinces of which we have the best information, we find their resemblance in all great leading features to Assam, very remarkable. Lofty mountains extending parallel to the S.W. and N.E. monsoons, and including extensive low vallies, whose lands are inundated by great rivers are features, common alike to the three provinces. We have no direct evidence to guide us to any conclusion as to the quantity of rain that may fall annually in either case, but according to Davis* the month of May at Canton is very wet.

After experiencing the droughts of the open plains of China, during the months of August, September, and October, each embassy, the one in 1793, and the other in 1816, encountered rains in November; the first on approaching the Poyang lake, and the second as soon as it entered the mountains in which the lake is situated. Yet Davis informs us, that at Canton rain seldom falls during the winter months, and that for a series of sixteen years the average fall of rain at Macao, in November, amounts to little more than 2 inches.† Hence, perhaps, we

* *General Description of China*, ii. 353. † *Ibid.*

may conclude that the mountain provinces north of Canton, are at no season exempt from rain; in proof of which I may quote the assertion of all, that their fertility is proverbial.* If we compare these facts with what I said of the climate of Assam, we may infer that a most striking similarity exists between that province, Kiang-si, and Kiang-nan with reference to humidity, but this will be further shewn to be the case.

The tea provinces of China all lie within the parallels of 25° and 31° N. lat., within which a group of mountains is extended from the Thibetan Alps on the west, to the shores of the Yellow sea, consequently crossing the course of the monsoons, whose vapours they may be supposed from all similar analogies to precipitate. There is here no general elevation of the land, no elevated plateau. The Po-yang lake which we are informed by GROSIER is occasioned by the confluence of four great rivers, is nearly an hundred leagues in length, "and subject like the sea to violent tempests." It is three hundred miles distant from the sea; and the Tong-ting lake still larger, is also situated in the midst of the tea province of Hou-quang, and is 200 miles more inland than the Po-yang. These lakes repose in vallies scarcely raised above the level of the sea, are united by navigable rivers and surrounded by low alluvial plains, subject to inundation, or at most only raised above the influence of ordinary floods.

The greatest river in China flows through these vallies, and though it takes its principal source in Yu-nan, only 400 leagues from the sea,† with scarcely a greater hydrographical basin than either the Ganges or Bramaputra, yet appears to transmit a volume of water equal to both; so that we must ascribe its size, as well as that of the two great lakes above mentioned, to the physical peculiarities of the tea provinces, and especially to

* "The abundance of Kang-si could furnish all China with a breakfast; but the province of Hou-quang alone could supply enough to maintain all its inhabitants."—GROSIER, ii. 69.

† GROSIER states Yu-nan to be the source, but more recent writers have extended it further.

the direction of the mountains in this part of China with regard to the monsoons.*

We are told by Sir GEORGE STAUNTON, that the waters of the Pei-ho dry up in a great degree, on the approach of winter; which he ascribes to the diminished energy of the sun in melting the snow at its source.

This must be the case of all great rivers, which depend on periodical causes for the supply of their waters, as is instanced by the Ganges, and Bramaputra; but the Yang-tse-kiang seems to undergo but slight remission, as proved by the difficulty experienced by Lord AMHERST, in making any progress against its stream in the middle of November, which they compared to the sea. The rivers on both sides of the hills, crossed by Lord MACARTNEY's embassy, when approaching the Po-yang lake, also in November, were so swoln by rain then falling in the tea provinces through which the embassy was at the time passing, that great damage was occasioned by the inundations.† But whether the great lakes and rivers of this part of China, be supplied from the atmosphere by the causes to which I have ventured to ascribe them, or not, I have no doubt it will be acknowledged that so large a surface of the vallies cannot be covered by waters, and excluded from prevailing winds by lofty mountains, without producing some such local influence on the climate as I have pointed out to be the case in Upper Assam.

As we have seen in Assam, clouds and mists will be the consequence‡ where low marshy lands are surrounded by mountains: but where these last are absent, as in the Sunderbunds of Bengal, although swamps and marshy lands may prevail, and the sun be ever so hot, the sky will continue clear, which is precisely the case in the inundated but open plains of Chang-tong; and

* The Kan-kiang river, which is well known as forming part of the line of water communication from Canton to Peking, rises and disembogues in the same province, with a hydrographical basin scarcely larger than that of the Thames, yet appears to transmit an enormous quantity of water, its breadth being according to BARROW 500 yards before it enters the Po-yang lake.

† BARROW, 532. ‡ See note to page 43, Sec. 33.

it is a remarkable fact, that these plains which are called expressively by BARROW the "country of inundation and drought," (and in which Father GROSIER tells us it seldom rains, and although the lands are inundated, the sky is clear) form the northern limit of the tea plant in China; * thus indicating the want of a more gloomy sky and humid atmosphere; for as all the plains are alluvial, soil and structure must be pretty much the same, whether in the open plains of the Yellow river, or the vallies of the Yang-tse-kiang.

35. Light being known to exercise considerable influence on vegetation, I am not disposed to venture an opinion as to whether it be to avoid that, or to obtain moisture that the plant resorts to vallies at the base of lofty mountains, and to the vicinity of lakes and rivers; but certainly there is no quality of the atmosphere of which it displays more independence than temperature, if we may judge from the wide range of latitude in which it is said to be indigenous.† Not that I consider that the plant in Assam affords any new argument on this score; on the contrary, it will appear from the following comparison that the assimilation of climate in respect to temperature, between Assam and the tea provinces of China, is much greater than some may suppose.

Mean temperature on the Po-yang lake, at 7 A. M., from the 20th to the 24th November, Lat. 30° North, 48 Fahr.‡	Mean temperature on the Bramaputra 7 A. M. for the month of December, while passing from Gowahatti to Suddya, 47. 01° Fahr.

These observations in both cases were made in boats, but as the metereological observations of the embassy, preserved from the wreck of the *Alceste*, do not extend beyond the 24th of November, and we did not commence our journey on the Bra-

* Mr. ROYLE, on the authority of Mr. REEVES, mentions that the tea plant is cultivated as far as 36½° North in certain mountain tracts on either side of the great plain, which affords some reason for expecting that under the humid atmosphere of mountain vallies, the plant may be found as far north in China as it is known to exist in the insular climate of the isles of Japan.

† Royle mentions its habitat as far south as 17° N. Lat, and Dr. ABEL (223) that it extends over the isles of Japan to 45° N. Lat.

‡ ABEL'S *Journey in China*, 409.

maputra until the first of December, I cannot unfortunately, draw any more direct comparison. It does not, however, appear from the observations occasionally made by BARROW, or by ELLIS, on the thermometer during the month of December, that the mercury underwent on the Kan-kiang river any sudden, or greater depression compared with the previous month on the Po-yang lake, than is usual at Canton, where the difference of temperature between November and December, amounts to 8° Fahr.

Even these data, slight as they are, will help to prove that the tea provinces of China participate little in the extreme climate of the northern plain; and that the winter experienced by those tea plants which were seen from Lord AMHERST's boats, on the 5th November, under cultivation and in full flower;* as well as those seen on the 8th of the same month, together with those which were seen on the 18th near the Po-yang, cannot be very different from that which is enjoyed by the tea plants in Assam, where they appear under similar general and local circumstances, except that they are not cultivated.

36. The small size of tea plantations, even in those provinces most celebrated for the production of the article, was a source of surprise and disappointment to all travellers who had an opportunity of inspecting them, and although a small individual plant, was on one occasion found by Dr. ABEL, quite detached from any of its species, yet on every other occasion on which tea has been found in China, wild or cultivated, numerous plants were congregated together, so as to constitute little colonies, seldom more extensive than those in Assam.

This circumstance appears to have led Sir GEORGE STAUNTON, and Dr. ABEL, to undervalue such plantations as happened to lie in their way, and to imagine the existence of others more extensive, but which they appear to have had no opportunity of in-

* ELLIS's *Jour.* Lord AMHERST's *Emb. to China*, ii. 49. The circumstance of these plants having been in flower in November, is a proof that they do not hybernate or sleep during winter. Our Assam plants in January when first seen were losing their fruit, so that the period of flowering would seem to be the same in both countries—a proof of the similarity of their climates.

specting—an error, if I may venture so to name it, the more natural, when we consider the vast quantity of tea that is annually exported from China; but we may rather suppose the number of small plantations to be very great, than that any of them are extensive.

37. The only locality in which Lord MACARTNEY'S Embassy witnessed the tea plant, was in the province of Che-kiang, near the city of Hang-tcheon, N. Lat. 30° 20′. On the low bank of the Cheng-tong river, where it was found on the "sides and tops of earthen embankments, dividing gardens (query, for restraining inundations) of oranges"; and Sir GEORGE STAUNTON says, of this tea "that it is seldom sown in flat marshy lands, which are reserved for rice."*

BARROW farther observes that "it was used for hedge-rows, to divide gardens, and not particularly cultivated for its leaves;"† but this may be doubted. He also states that the plains intervening between the rivers and the mountains, were planted with sugar-cane, and that an estuary in which the tides ebb and flow, was observed in the vicinity.‡ Sir GEORGE STAUNTON describes the weather here in November as dark and cloudy, although the "thermometer was seldom observed so low as 48° Fahr.," which he ascribed to the "winds being hemmed in between mountains and accelerated in their motion."§ BARROW remarks that the mean temperature of this province, in the middle of November, was from 56° at sunrise, to 62° Fahr. at noon. "It abounds in lakes and is intersected with rivers and canals," he says, "like Kiang-nan." Speaking of the treatment of the silk worm, he says, it is here necessary "*in fine weather* to expose the young to the sun," from which it would seem, as if the latter were a less common occurrence in Che-kiang than in the plains of Peking, where they had nothing but sun from their arrival in August until they entered the mountain vallies of the latter province in November.

38. The first tea plants that were seen by Lord AMHERST'S Em-

* Lord MACARTNEY'S *Embassy*, ii. 464. † *Travels in China*, 530.
‡ Ibid, 529. § Lord MACARTNEY'S Embassy, vol. ii. p. 469.

bassy, were near the village of Ta-tung, under the 31° N. Lat. *in the great valley of the Yang-tse-kiang river, within a walk of the boats. Barometer on the river, 30°13.' Thermometer, 63° Fahr. Leslie's Hygrometer 58°* ELLIS speaks of this plantation in the following words: "Our walk," (towards a lofty range of mountains rising in the distance from undulating plains,) "led us* through a valley where we saw the tea plant for the first time. It is a beautiful plant, resembling a myrtle with a yellow flower. The plantations were not here of any extent, and were either surrounded by small fields of other cultivation, or placed in detached spots.† Dr. ABEL (*who was not with the party*) says this plantation is on the side of a hill."‡

The geology of the country approaching Ta-tung is thus described by ELLIS; "A sandy beach covered with pebbles, resembling a sea shore. The pebbles belonged evidently to hills rising immediately from the beach and composed of similar pebbles imbedded in loose sand. Oaks not growing beyond the size of large shrubs, and a small species of fir covered the sides of the sand hills."

39. Three days after leaving Ta-tung, the boats were anchored at an island in the vicinity of several smaller islands, in the great river near the village of Woo-sha-kya. "There are," says ELLIS, "evident traces on this as on the other islands of their being at times inundated, if not wholly submerged; I crossed the water and took a ramble in the interior, more remarkable for the facility with which a stranger might lose himself, than for any other circumstance. As far as the eye reached there was a succession of hollows and elevations; the highest points with clumps of trees. The cultivation consisted of cotton, buck-wheat and beans; and one plantation of tea was met with in full flower."§

It is worthy of remark, that Dr. ABEL who was still unfortunately confined to his boat by sickness, places this as well as the former plantation, (neither of which he could have seen,) *on hills.*

*See Dr. ABEL's map of the Yang-tse-kiang and Po-yang lake.
†ELLIS, vol. ii. p. 46. ‡Tour in China, 164. §ELLIS, vol. ii. p. 51.

40. On the 18th November, the tea plant was again found by *Ellis, who appears to have been indefatigable in his excursions. The embassy had now reached the Po-yang lake, expressively denominated by Barrow the "sink of China," in consequence of the low, marshy lands by which it is chiefly surrounded. It is described by Ellis as sixty miles in length, exclusive, I presume* of an equal extent of deltas where great rivers enter it on the South;* and its breadth could not be determined in consequence of the number of islands with which it is interspersed. A lofty mountain called Sew-sham, described by all as stupendous, and bold feature ascends from the marshes at the northern extremity of the lake, and which, with other high altitudes with which it is connected, may be supposed to contribute to the condensation of vapours which are constantly rising from the waters and marshes at its foot, and here observes Ellis " the tea plant was again found, *but still in small patches*." The Sew-sham had snow on its summits when first seen, but which melted, the following day under the rays of a bright sun.

41. If we consider (37 to 41,) the only situations in which the tea plant has been seen, by the two British Embassies; and the descriptions derived therefrom, by those who inspected them, reduced simply to what was witnessed, I feel assured that no one will agree, to the full extent, with the conclusion of Dr Abel which I am about to quote. " It appears," says he, "from every account given of the tea plant, that it succeeds best on the sides of mountains, where there can be but little accumulation of vegetable mould; our opportunities of seeing the tea plant were few, but they were all in favour of this conclusion."

The above conclusion, as well as his recommendation of Table mountain at the Cape, shew how essential he conceived high altitudes for the cultivation of the plant; and as his authority might be cited in favour of an opinion that the plant is out of place in Assam, I have thought it necessary to examine the degree of experience on which this opinion rested. If any thing further

* Grosier as I have already quoted, states the lake to be nearly one hundred leagues.

remains to convince us, that the tea plant of Che-kiang (37), and Kiang-nan (38 to 40), is an inhabitant of low, moist inundated situations, where it grows on mounds, embankments, and spots of peculiar geological structure, it is the fact of its only having been found by the embassies, while in boats on the great rivers and lakes. Lord MACARTNEY's embassy had an excellent opportunity while crossing the ridge that separates two of the best tea provinces, Che-kiang and Kiang-si, for determining the character of the plant, were it an inhabitant of that tract; yet it was not met with in this part of the journey, which lay too, almost in a line across those hills marked in Dr. ABEL's map as green tea districts: nor did this, or the subsequent embassy find it on crossing the Me-lin mountains, although Dr. ABEL found it before quitting his boat, at the northern foot of the mountains, on the Kan-kiang river.

42. The *Comellia olifera*, which we are told by Sir GEORGE STAUNTON grows in stony lands on "the sides and very tops of mountains," from its resemblance to tea, and from the circumstance of its bearing the same name among the Chinese,* may have been taken for it by the Missionaries, in some instances; thus giving rise to erroneous accounts regarding the habits of the latter. Another reason which may have contributed to the belief that high altitudes, (out of China,) are necessary for the cultivation of the plant, is the supposed lower temperature of China, generally during winter, than other countries in the same latitude; but there is reason to believe that this peculiarity is confined to the plains of Peking, and to certain open tracts, exposed to dry winds. It is one of the properties of a humid air to be little liable to sudden transitions, or great extremes of heat and cold; and we certainly find in the careful perusal of what has been published on the subject, a combination of all that is calculated to promote such a condition of climate in the tea provinces.

* General Description of the Empire of China, by J. F. Davis, Esq. F. R. S. vol. ii. 352.

† Lord MACARTNEY's Embassy, vol. ii. p. 467.

43. The maritime province of Fo-kein bears few features in common with the other provinces, to which Assam has been compared; and the teas here produced are different, being what are called *black*. It may probably be found that moderately elevated coasts, under certain circumstances, afford climates analogous in some points, to those of deep vallies furnished with extensive waters, under circumstances favourable to the production of vapours.

44. The tea plant is in China an associate of certain families, some, perhaps the most peculiar of which, also accompany it in Assam:* but the flora of the latter is deficient in pines, an order which some may suppose to be characteristic of the climate in which the tea plant ought to be cultivated. This may also have led to the general impression that high altitudes were requisite for the above purpose.

The only way in which we can distinguish between such plants as are accidentally associated, and those whose local concurrence depend on some peculiarity in which they are naturally concerned, is by enquiring into the degree of affinity that may exist with reference to their habits.

From the tea plant being indigenous to an extensive range equal to 28° of latitude, with little reference to altitude, we may suppose temperature to have little influence on its distribution. But in order to avoid exaggeration, I will confine my observations to the limits within which it is known to be cultivated with success; that is, from Fo-kien in the 24° N. Lat. to Meaco in the isles of Japan, in about 35° N. latitude. In these situations, eleven degrees from each other, the tea plant is cultivated with equal success, at an equally inconsiderable elevation above the sea. Now supposing these tea plants were endowed with the habit of pines, those in Fo-kein would then require to be 3,420

* See GRIFFITH's new genus of *Homamelideæ* Asiat. Res. vol. XIX. 99. The habits of his *Sedgewickia Crassifolia* compared with *Homamelis Chinensis* (ABEL's *Journey in China*, 375) is of great interest in this enquiry.

*feet above those at Meaco.** *In Lapland under the 68° N. Lat. pines are capable of bearing a mean temperature of 31° Fahr. at an elevation of 957 feet. In the Alps, under the 44° N. Lat. they disappear in the mean temperature of 35°* Fahr. at an elevation of 5,850, and in Mexico under 19° N. lat. pines are incapable of supporting a lower temperature than 44° Fahr, at an elevation of 13,000 feet.

Thus it seems that as they approach the equator, pines become less capable of bearing a low temperature, than in northern latitudes: but in consequence of the height to which they must ascend, the point is left in doubt whether it be the greater humidity, or the greater rarity of the air of their situation in low latitudes, that occasions this aberration in their nature with regard to temperature. If humidity occasion it, as it probably does, their inferior limit throughout the extent of their vast zone, will be liable from the same cause to frequent aberrations, according to the moisture of climates. And thus the humidity, and uniformity of temperature in the tea provinces of China, would seem to favour an unusually tropical development of their region; so that the presence of the *pinus massoinana* or what Ellis calls a "small species of fir, on the sides of hills" little above the level of the sea in the 30° N. latitude, is not to be taken as an incontestible proof of the low temperature of the provinces of China as has been generally insisted upon, especially as the other productions of the soil such as rice, sugar-cane, cotton, bamboos, and oranges, along with which the tea plant has been always found, are satisfactory evidence of a contrary nature.

45. It is clear from the object of the foregoing report, that every branch of natural history is equally concerned in it, and that while enquiry cannot possibly embrace too much, or be too closely directed to every object presented by the physical geography of the country, it would be comparatively useless if restricted to the mere examination of the tea plant and soil, from

* On Mount Perdu, lat 44° N. pines are found at an elevation of 7,800, while in Lapland 68° N. they disappear at 957 feet. See Lindley's introduction to Botany, 481.

which alone we could scarcely draw a conclusion that would prove satisfactory, because we know comparatively nothing of the operation of soils upon vegetation.

The study of natural history is now no longer confined to the external characters of species, or the business of the naturalist who travels, to the mere accumulation of specimens; but is extended to the habits and affinities of entire groups that are not to be examined except upon the spot, or collected, but in the mind of the philosophic naturalist, who ought to be capable of viewing them in all their relations to each other, taking care however that his general views are based on an intimate acquaintance with the details of species.

The affinities and analogies of groups and families have already been established in ornithology by the genius of our countryman SWAINSON; so that this class already presents a beautiful chain of groups, diverging not merely into each other, but also into other classes of animals by such links as the Cassowary, a bird that cannot fly nor swim, and the Grebe on the contrary, whose feet as well as wings are only constructed to perform the office of fins. By examples of this kind, he points out how the inhabitants of the air, such as the swallow, whose wings are formed for its only support, pass by a succession of steps into those classes whose habits are terrestrial, as well as into that class which is excluded from "the elastic air and consigned", to use the words of CUVIER "to eternal silence."

These connections once established between natural families and classes, it will then become the business of philosophy to trace their existence between the different kingdoms of nature. Those which connect the two organic kingdoms have been long known to exist under the name of Zoophytes; but those links which connect organic, with inorganic nature are more obscure, although the mutual effects of these opposite conditions of matter upon each other, are of the most familiar occurrence, such as the influence of soil upon vegetation, and of peculiar rocks in the development of certain diseases; but as the latter is foreign to the objects of this report, I merely refer to it as one

of the probable dependencies which every where exist between the various objects of the creation.

I have already hinted at the importance of Zoology as calculated to assist in casting a light upon the peculiarity of climates, and as affording data for the comparison of one with another. If we consider how instrumental birds for instance are, in the dissemination of plants, how essential certain seeds and certain flowers are to the support of certain animals and insects, we perceive at once rational grounds for expecting to be able to trace an accordance between the vegetable productions of our country, compared with those of another, when the Zoology of both agree in particular features: and hence the application of these principles to the present object.

The preponderance of Malayan over northern forms in Assam, notwithstanding the lofty range of mountains which might be supposed to contribute to an opposite effect, and rather attract animals towards the South is an interesting indication which will be at least corrected, if not confirmed by my collections. But though lofty ranges of mountains afford climates equal to certain proportions of higher latitudes, yet animals in order to enjoy such insulated positions would be confined to ridges only, without being able to indulge their natural wandering propensities except under exposure to the heat of vallies. On the other hand, animals of the South may extend considerably beyond the strict limits of their geographical sphere, by taking advantage of the shelter of mountain chains, and thus experience no very remarkable change of circumstances from what nature intended they should bear; and in this way we may account for many of the peculiarities of the natural history of Assam, which are not confined to the tea plant, but extend to other species perhaps equally restricted in their habitat. In the animal kingdom the interesting genus Ciconia of Cuvier presents two distinct species of crane as large as the adjutant (ciconia dubius) and which are quite unknown in Bengal or any other part of India. I have already adverted to a large squirrel as peculiar to Eastern Assam, and although it is there extremely common, not an individual has been found in Lower Assam: or even

beyond the Northern limit of the alluvium. From thence it is probably extended to the eastward, but occurring only in vallies affording similar vegetation, and consequently possessed of similar peculiarities in structure and climate to Assam. The Simia Hylobites agilis Duvaucel, a species of ape, appears from the observations of Dr. HARLAN to be almost equally limited to Assam and its vicinity.*

If from the lower animals we now direct our attention to the various tribes of man which compose the several nations by which Assam is surrounded, we shall find the same line of demarcation interposed between the eastern and western varieties of this species, as already observed with reference to other beings. The Singphos, or people who inhabit the Dupha mountains display in the construction of their face, the light colour of their skin, their manners and ingenuity, the almost pure Mongolian or Chinese race. The Nagas on the contrary, who inhabit the vast mountainous country extending from Assam to the frontier of Birma, incline, (if I may judge from the few individuals I had an opportunity of witnessing), to the most degenerate of Caucasian Hindoos, but without a trace of their religion. Yet it is a curious fact, that the Kossia tribe, which occupies the western extremity of the same mountain-group, are a well marked branch of the Mongolian race, which here appears to have extended to the extreme point where the climate and natural productions cease to resemble those of the countries from whence they were derived; and thus surrounded by powerful Caucasian nations, and intercepted by the Nagas, this insulated people appear not merely to have maintained their independence; but the purity of their blood, as well as distinct customs, language, and religion.

In this way we derive from Zoology additional aid in support of those views which the sister sciences afford, and are taught to look upon the tea plant in Assam, thus associated with the natural productions of Eastern Asia, not as an alien estranged from its own climate, but as an indigenous plant neglected it is

* It is described in his Medical and Physical Researches, Philadelphia, 1835, page 10, as a new species under the name of Simia hoolock.

true by man, but in the full enjoyment from nature of all those peculiar conditions on which its properties will be found under proper management to depend.

II.—*Notes on the Agriculture and Rural Economy of the Valley of Nepaul. By* A. CAMPBELL, *Officiating Assistant to the Resident.—Compiled chiefly from Verbal Information, and Personal Observation: access to Authentic Documents not being obtainable. Cathmandu, January 1st,* 1837.

To B. H. HODGSON, *Esquire,*
Resident.

Nepaul, January 14th, 1837.

SIR,

I HAVE the honour to submit to your favourable consideration the accompanying Notes on the Agriculture and Rural Economy of the Valley of Nepaul, in the hope that, although confessedly very imperfect, they may be deemed by you worthy of transmission to the Governor General.

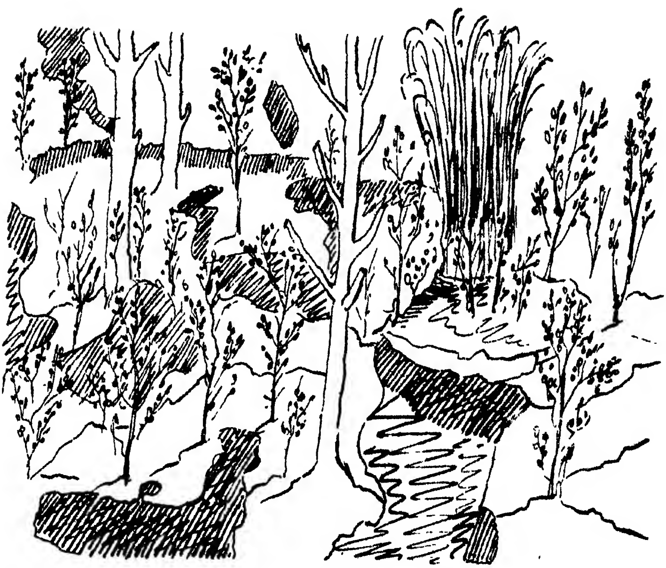
2. Ere long, I hope to add to this Paper "an Agricultural and Horticultural Calender," along with details of such matters connected with the subject of these notes, as may be considered interesting, but for the present have been omitted, pending further enquiry and more correct information.

I have, &c.
(Signed) A. CAMPBELL,
Offg. Assistant Resident.

"Nihil est melius, Nihil uberius, Nihil homine libero dignius."

INTRODUCTION.

The summary notices of the state of the art of Agriculture, as



Tea Colony at Cujoo Village

cluding the retiring vallies, may be estimated at 20 miles, with an equal breadth, similarly calculated. The valley proper, or such an area as might be squared by drawing a line along the inner extremities of the mountain spurs, has a diameter in either direction of about 15 miles. Within this space however, is included

' Mr. Hodgson.

"Nihil est melius, Nihil uberius, Nihil homine libero dignius."

INTRODUCTION.

The summary notices of the state of the art of Agriculture, as well as its produce, in the accounts of Nepaul by KIRKPATRICK and HAMILTON, being too limited to convey a correct notion on these subjects, and the only person sufficiently qualified to do justice to the subject* not having as yet completed the task, it may not appear presumptuous in me, to throw into a connected form, such facts as have come into my possession. The following pages will be confined strictly to details of agricultural processes and to such circumstances as are intimately connected with them, without any attempt at drawing such general conclusions, on the state of the population, or nature of the Government, as are frequently and legitimately made, and almost naturally flow from a consideration of the main objects of life, in a rude state of society. To other hands these generalizations are better left for the present.

The entire surface of the valley of Nepaul is either under regular cultivation, or capable of being so. It is completely free from rocky and stony tracts, as well as sandy wastes, and with very few exceptions, the fields have a superficial stratum of nutritious soil, a foot or more in thickness. The area of the valley in the absence of a professional survey, cannot be correctly stated; nor is it easy to make a near approximation to it, on account of the irregular outline formed by the basis of the boundary mountains, which throw spurs inwards in some places more than a mile in length, forming bays or subordinate valleys of considerable extent. The average extreme length from east to west, including the retiring vallies, may be estimated at 20 miles, with an equal breadth, similarly calculated. The valley proper, or such an area as might be squared by drawing a line along the inner extremities of the mountain spurs, has a diameter in either direction of about 15 miles. Within this space however, is included

Mr. HODGSON.

the low ridge of hills which being given off at Dochoke, the western mountain boundary of the valley, runs eastward and by south, crossing the channel of the Bagmutti river, until it terminates in the general level near the village of Sussanally, situated at the south-east corner of the valley. The above limits give as a *maximum average of arable surface 400 square miles, or 3,56,000 English acres, and as a minimum average, 222 square miles, or 1,42,000 acres. The former, on account of the hilly portions which intervene in the subordinate vallies, and are but partially cultivated,* is considerably I believe beyond the mark, while the latter estimate, from excluding altogether the retiring vallies, is to that extent deficient, as the surface of these subordinate vallies, is of greater extent than the uncultivated proportion of the mountainous spurs which form them. We may I think safely assume as a mean, and correct diameter to the arable land 18 miles in each direction, which gives an area of 324 square miles, or 2,07,360 English acres asunder, or fit for agricultural operation, and for yielding the higher descriptions of produce. There are precipitous portions of the mountainous faces bounding the valley, particularly on the south and west, where Indian corn and Murwa are occasionally cultivated; but the angle of these is so acute and the soil so unproductive as to render the husbandry of the rudest possible description and their produce too scanty to entitle them to be included in the regularly cultivated valley land. To speak generally, the mountain bases bounding the valley, too steep to admit of being cut into terraces, are excluded from the area above laid down; and with sufficient reason, as in such lands, water cannot be retained for the growth of rice, and the quality of the soil is such as not to admit of the sowing of wheat, or any of the numerous and nutritious pulses, which abound in the more level lands. The crops of such places are limited to Indian corn, Murwa, and Phofur.

The general appearance of the valley, viewed from the summit of any of the surrounding mountains, is that of a series of hills with intervening vallies, irrigated plentifully by miniature canals, and traversed in a waving line from north-east, to south-west by a moderately sized river, in which many of the stream-

lets directly terminate, and in the direction of which all are bending their course. This appearance is not so striking in the drier months of the year, although sufficiently evident even then, as during the rainy season, when the Bagmutti river by which the entire waters of the valley quit its boundaries, may *be most aptly likened to a large venous trunk of an animal body, formed by innumerable smaller branches, each collecting at their source the fluid which animates as it runs, the bodies which surround it.* From the cloud capped mountain peaks these little feeders take their rise, increasing as they rush down the precipitous sides, until, arrived at the more level base, they grow calmer and less fretful, permitting themselves to be diverted by innumerable channels into the fields below, and their speed to be wasted by diffusion over the terraced flats prepared for their welcome reception. Others of these feeders issue in considerable volume, and at once, from the foot of the hills; forming abundant, and permanent springs of the clearest water. This occurs especially at the foot of Nagarjun, a high round-shaped hill forming the western boundary of the valley, covered by a thick stratum of soil from base to summit, and having in the neighbourhood of the spring no water course for the torrents along its face. At Nilkanth on the northern, and at Godawrey on the southern boundary, there are similar springs which continue to pour forth a steady stream throughout the year. Each of the springs is the favourite resting places of the respective presiding deities, whose images alone are now extant; but according to popular belief these holy emblems are of divine origin, not having been made by human hands.

Viewing the valley from its centre, and contrasting its surface with the masses of mountain which surround it, it has the appearance of a plain gradually rising on all sides to the bases of the mountains, but a more careful examination points out a division of its surface into two separate elevations. These I shall call the *higher* and *lower levels* of the valley when describing the agricultural occupations of different seasons, as the general system and routine of husbandry varies on each. In the above division of the valley's surface, the hill sides under rough

cultivation are not included. The lower level through which the two principal rivers (Bishomutti and Bagmutti) and their feeders run, is for the most part, nearly flat, having a very gradual descent from either side of the valley towards the main streams. Its soil is less clayey in general than that of the upper level, and from the greater facility of irrigation and certainty of flooding during the rains, its crops of rice are more productive, and its value for purchase and rent higher. The upper level, has for the most part, an elevation of from 30 to 80 feet above the lower. In some places the one gradually runs into the other, the transition being unaccompanied by any sudden or defined line, terraces of cultivation extending from the top of the upper level, down to the river edges. In other places the one is defined by perpendicular descents of 50 or more feet, along the basis of which the rivers sometimes have their course, while in a third place these precipitous banks point out the different levels far removed from the streams. The extreme height of the upper level is no where more than 100 feet above the lower; for the hill of Simbhunath although, at first sight belonging to this division, is really a spur from the neighbouring hill of Ek Changu. The hill near the temple of Pusputnath is elevated more than 100 feet above the Bagmutti, as this stream winds its course round three sides of it; but this hill may also with propriety be excluded from the valley levels and looked upon as a portion of a low range of hills stretching from north to south, and crossing the course of the Bagmutti. The Gankurun hill, which is a spur from Sheopooree, forms the northerly extremity of this partially defined range; on the south it vanishes gradually into the ordinary higher level of the valley lands.

To recapitulate summarily, we have in the valley of Nepaul, an area of 325 square miles of arable land, forming a basin of uneven surface surrounded by a circular chain of mountains, varying in height from 500 to 2,000 feet above the plain, watered by innumerable streams, and blessed with a healthy climate and a fruitful soil. The capital of Nepaul is placed by BUCHANAN in North Latitude 27°42′, and East Longitude 85°36′, the mean elevation of the valley is reckoned at 4,782 feet above the plains

of Bengal, and the heights of its surrounding mountains by barometrical measurement are as follows.* Mahadeo Poker, or the highest peak of the eastern boundary, 6,786 feet; Jaber Powah, the north east boundary, 5,716; Sheopooree, or the highest peak of the northern boundary, not known; Colonel Powah, on the north-west corner, 6,654; Chandragiree, or the southern boundary, 6,600; and Phoolchoke, bounding the south-east corner, 6,800. These circumstances exercise such a powerful influence over the produce of the soil, as regulators of climate, that they will not, I presume, be deemed out of place as prefatory observations. The mean annual temperature of the valley is 64°. The population of this area was estimated by Mr. HODGSON, in 1832, at no less than 2,90,000 souls, which allowing 400 square miles as its inhabited extent, gives the extraordinarily large number of 725 to the square mile: a proportion so far as I am aware, not known to exist in any country of the world, and one which I believe Mr. HODGSON is willing to allow to have been rather exaggerated even for the valley of Nepaul. It is however certain that this valley teems with human beings, its whole surface being sprinkled with towns, villages, and insulated dwellings. No portion of India with which I am acquainted can be compared to the valley of Nepaul in density of population, and it is not improbable that after the most correct estimate shall have been obtained, it will shew a population, compared with its area, equal in extent to that of any country in civilized Europe. Allowing the utmost possible extent of area to the valley within its mountainous boundaries, we could not assume more than 30 miles in length, and as much in breadth,† as its dimensions, or 900 square miles; and at this exaggerated rate, we should still have, by Mr. HODGSON's estimate, a population of 322 and a fraction to the square mile. In East Flanders, as containing the maximum rate of all Europe, a recent census gives 560 souls to the square mile. In the most populous parts of Ireland the

* Captain ROBINSON is the author of the observations which give these measurements.

† These are the limits assumed by me taking in the sub-valleys around the big one.—B. H. H.

greatest proportion to the square mile is 345 souls. In Berkshire in 1831 it was only 193 to the square mile. In Bengal it is estimated at 203 to the square mile,* and in the cultivated portion of Orissa it did not exceed, when Mr. STIRLING's report was compiled, 135 to the square mile. The population, whatever be its real amount, is almost entirely agricultural, as, with the exception of the soldiery stationed at Cathmandu, amounting to 6 or 7,000 men, and the chiefs and higher officers of Government, every inhabitant is more or less directly engaged in the culture of the soil. The artizans, religious orders, and persons employed in the government offices do not, it is true, actually labour in the field, but being almost universally the representatives of the Irish middlemen, and Scottish tacksmen, they come correctly under the denomination of Agriculturists. The poorer artizans, such as carpenters and bricklayers, divide their time between the practice of their trades and the culture of their little fields, while the better class of tradesmen, although enabled to confine the work of their own hands to their crafts, are invariably holders of land, sometimes cultivating it by means of hired labourers, but most commonly by the system of subletting to the Jâpoos, or the strictly speaking agricultural class of the Newars. The arrangement usually made by these land holders is for the receipt of one half the produce, the actual cultivator retaining the other, as his wages of his labour.

Formation of the valley soil.—The soil of the valley, although considerably diversified, is in the mass composed of alluvial deposite, there being no traces on the general surface either of the primary or secondary rocky formations; indeed, throughout the entire extent of both levels, there is not a stone of any magnitude, and scarce a pebble to be found. The only rocks accessible within the valley, are those composing the diminutive ranges described as spurs from the surrounding mountains, and

* Mr. BAYLEY estimated the population of Burdwan in 1814 at 600 to the square mile, but this district is incomparably the most populous one in Bengal, as Lancashire is of England. In the county the population is estimated as high as 800 to the square mile, a difference from that of Berkshire greater than between Burdwan and Bengal generally.

trans-secting the basin. These are of several kinds, some of them, as in the more easterly portion of the range which tends from the west towards Sussanally on the east, contain a considerable quantity of carbonate of lime, but so intimately blended with a clayey slate stone, as not to admit of being converted into quick lime by burning, although it will frequently effervesce on the application of muriatic acid.

To the west of the Sumbhunath hill again where there is a stone quarry, *the rock is either of grey granite, or of a crumbling sort of sand stone tinged with a reddish yellow colour. The* Gankurun *hill is composed, at its northern extremity, of hard granite with a superficial stratum of clayey slate,* which is under constant decay, leaving a reddish clay soil along the sides. The granitic portion is exposed to the extent of 20 or 30 yards in the bed of the Bagmutti as it passes through a cleft on the northern extremity of the hill, the stratum forming an obtuse angle (say of 20 degrees) with the horizon. Of whatever variety, the superficial soil must, I think, be regarded as a debris formed during ages of decay from the surrounding mountains; for although the composition of the soils occupying the central parts of the basin may not be easily traceable at the present day to their mountain progeners, the similarity in many places of the soil along the mountain bases, and stretching for many hundred yards beyond them into the valley to the earthy or rocky formation of the hills immediately over them is distinctly manifest. An example or two of this may be recorded; the southern aspect of the Sheopooree boundary, is formed, to an elevation of about 800 or 1,000 feet from the mountain's base, of a white micaceous sand stone, and we find the superficial stratum of soil which extends into the valley, on the higher level, for about a mile, of a very light sandy nature, largely mixed with mica. The superficial stratum of the valley face of the Nagarjun mountain is principally composed of a stiff and hard red clay, to which we find corresponding in the whole of the cultivated land lying along its base from the Sumbhunath hill to Ballajee, a distance of three miles, a great predominance of this substance.

The process of addition to the valley land from the mountain

debris is in some places at this time in such active operation, as to be distinctly observable in annual additions to the cultivated spots extending up the declivities of the mountains. On the valley aspect of Chandragiree which forms the south west boundary, *this process is very obvious. The valley by traditional lore is described as having been an immense lake, the Sumbhunath and Pusputnath hills forming lands on which the gods found resting places and appropriate sites on which to be worshipped.* The drawing off the waters is of course ascribed to the direct agency of some of the local deities, and "*the Sabre* cut," though the southern boundary of the valley forming the only outlet for the present waters, and the one by which the lake was emptied, is still pointed out as the handy work of a renowned demigod (Manja Ghosa by name). An earthquake, with which the people of the Himalayas are sufficiently familiar now-a-days, as they doubtless were in remoter times, is an agency they will not accept of as more likely to have burst asunder the rocky barriers of the lake and given exit to its waters. HUMBOLDT or JACQUEMONT could probably have solved this interesting question. It is remarkable that in no part of the valley are fossil shells of aquatic races to be found, a circumstance sufficiently curious when taken in combination with the opinion of the former state of the country. Dr. BUCHANAN seems to have assented to the popular notion on the subject, without offering an explanation of his views. It is however certain, that if the narrow passage through which the river now flows did not at any previous time exist, the tract above it, which includes the whole valley, must have been a large lake, formed by the pent up waters of the surrounding hills, which now form the Bishomutti and Bagmutti river, with the innumerable tributary streams. Not a drop of water finds exit from the valley, save by this one narrow outlet, which pours its torrents in a southerly direction through the Mahabharat and lower ranges of hills, into the plains joining the Ganges near Monghyr. The waters from the outer side of the northern, eastern, and western mountainous boundary of the valley, run east and west, the former falling into the Koosi, the latter into the Tirsoolgunga of the hills or

Gunduck of the plains. The Koosis, (for there are several streams bearing this name within the hills east of Cathmandu), unite their waters in the plains, and fall into the Ganges opposite Bhaugulpoor. The Tirsoolgunga reaching the plains at Tirbeni, flows throw Sarun to the Ganges, joining the latter river at Hajeepoor.

General Properties of the soil.—Sir HUMPHREY DAVY says, that "the bases of all common soils are mixtures of the primitive earths and oxide of iron," and that "soils in all cases consist of a mixture of finely divided earthy matters, with vegetable or animal substances in a state of decomposition." It is the predominance of some one of the primitive earths in any soil that gives it its distinguishing character and name. In those soils having alumina most abundant, there is a stiffness, and binding principle which at once points them out as clayey. Where silica most abounds, the soil is called sandy; and lime as the predominant earth, gives the third great division of soils, the calcareous. In proportion as the other earths are in subordinate combination with the chief one, the qualities of soils vary, giving rise to subdivisions, which it is important for the agriculturist to note. The oxide of iron, when in sufficient quantity to tinge a clayey soil with a reddish, or deep orange colour, forms the ferruginous clays; and by an admixture of magnesia, manganese, or carbonate of soda, the soil assumes properties with each of these substances, which modify in a great measure its productive powers.

Calcareous soils are scarcely known in the valley, and Loam or that description of soil, in which vegetable matter predominates over the earthy substances, is equally rare; indeed, it does not now exist, unless as a superficial coating to the earths in the woods within and around the basin. The clayey and sandy soils are the obvious divisions here; varying in the one case, as is usual elsewhere, from the stiff, unproductive clay, having scarce any admixture of vegetable or earthy matter, to a light, friable, and fertile soil, and in the other, from pure siliceous sand, to the richest and most appropriate composition of earths, and other nutritious ingredients.

The distinguishing characteristic of this soil, is the absence, or rather scanty presence of lime, either in the shape of the calcareous nodules called kunkur, (a carbonate), or in the heavier and less productive form of Gypsum, (a sulphate), and in the general diffusion of sand even in the soils distinctly clayey, there is a large proportion of light coloured sand.

The quality of the soil, however, in Nepaul, is of little moment in comparison to the facility and certainty, or otherwise, of irrigation and flooding. In a country where rice is the staple of life, the relative value of land would be but badly indicated by pointing out those portions of its soil which contained in the most favourable proportions, the different earthy and vegetable ingredients. The quantity of water always procurable is the true index to the value of land under such circumstances, but modified nevertheless to some extent by the nature of the soil. None of the earths alone are capable of supporting healthy vegetation, nor is any soil fertile, which contains 19 parts out of 20 of any one of them, so that pure sand, which is very nearly equivalent to pure silica, cannot, however well flooded, bear a crop of rice; but an admixture of other substances to the small extent of 1-9th will render sand fit for the production of ordinarily good crops.* As I cannot at present furnish correct chemical analyses of the different soils, it will be sufficient to say that I have examined their physical properties attentively, and believe that a rice crop may be, and is raised, in soils holding even less than one part of other matters to 8 of pure siliceous sand.† These soils are of course abundantly flooded, and have some vegetable and animal manure laid on previous to the transplanting, which raises the proportion of fertile matter temporarily; I speak of them as they lie during the cold season after having given their annual crops. Lands of this kind are for the most part in the vallies of the different streams, generally near their beds, along the Munohara river; in its early

* See Sir H. Davy's Agricultural Chemistry.

† The examination of the valley soil is renewed and rendered more complete towards the end of these notes.

course through the cultivated land, as well as along the Bishomutti, this description of land is most abundant.

Clay and sand in about equal proportions form the bases of the most fertile portions of the valley. Where there is a falling off from this point, (in so far as soil is concerned), it is remedied by supplying the former, never by adding the latter; vegetable and animal manures are applied to all the varieties of *sandy* and *clayey*, without reference to the predominance of either. Mica minutely comminuted abounds in all the sandy soils, and is also occasionally found in the clayey ones.

The comparative scarcity of oxide of iron over such an extent of arable land, is also remarkable. No where is it sufficiently abundant to give that rusty tinge to the superficial moisture of the fields which so clearly indicates its presence where predominant.* The usual saline ingredients are also wanting to the extent of deteriorating, or in any sensible degree giving their character to, the soil. Neither carbonate of soda, (kari), nitrate of potass (shora), or common salt, one and all so injurious to agriculture, are to be found superficially formed or existing in the deeper strata. It will be seen therefore that in the properties of the soil there are few natural disadvantages to the cultivator in the valley of Nepaul. It must be borne in mind that it is not intended to convey the idea of exact uniformity existing in the superficial soil, over large tracts of cultivated fields, when it is said that the soils are either *clayey* or *sandy*; indeed it is sometimes much otherwise, for I have often examined fields of not more than five or six acres in extent, in one portion of which the upper stratum was pure sand, in another *sandy*, and in a third, equally composed of *sand* and *clay*. This is not peculiar to Nepaul. Sir H. Davy in noticing the varieties which occur in the upper stratum remarks, that "in vallies and near the beds of rivers, there are very great differences, and it now and then occurs that one part of a field is calcareous and another part silicious;" *these* are the extremes of variation in the widest sense; *those* above named are the extremes in Nepaul.

* Except the stiff red clays alluded to already, there is no red soil in Nepaul. The fields when dry, whether sandy or clayey, are of a light grey colour.

Manures, natural and formed.—By natural manure is to be understood all substances, employed as renovators of the soil, which are found native, on the earth's surface, or are dug out of its bowels. In the valley of Nepaul there are but two substances of this description in use, one of them and that by far the most extensively employed, is a fossil earth of a grey blue colour when fresh dug, and of a dark blue, or almost black, when dried; very fine in its texture, and almost impalpable when pulverised between the fingers. It is found very generally diffused throughout the whole valley, in the lower as well as the higher level, always as a substratum, never as the upper one, sometimes lying within one foot of the surfaces; in other situations, at 3 or 4 feet. Occasionally its stratum is not more than a foot or two in thickness, while in other parts it is 20 or more. As for instance, to the west of Bhatgaon, and north west of Patun, where the higher level slopes gradually towards, and terminates in, the lower one on the left bank of the Bagmutti. This substance is generally dug up during the winter months, or the early part of spring, (January, February and March,) and allowed to be exposed to the atmosphere in heaps until the sowing season of the first rice crops commences, when it is carried out into the fields, beat into fine powder and spread over them: at other times it is dug in baskets full, and conveyed at once to the fields, and laid down in small heaps, or scattered about in lumps, until the preparation of the soil commences, when it is powdered along with the soil. When recently dug and moist, its consistency is firm and tenaceous, cutting under the kodali* like the first clay, its cut surface being smooth and shining with a semi-metallic lustre like plumbago. In this state it is with difficulty reduced to powder, but when dry, although the adhesion of its particles to one another is still considerable, it crumbles by heating into the finest possible powder. The strata of this earth found within the valley, are almost invariably, (wherever found,) free from sand, or stones of any

* Nepalese hoe.

kind; occasionally it has minute particles of mica embedded in its substance.

The universality of its employment as a manure, whether on clayey or sandy soils, renders its properties of much interest, especially as its composition indicates its usefulness; for one class of these soils only, chiefly consisting of siliceous matter, its application to clay or calcareous soils, is highly appropriate, but how are we to explain the mode of its fertilizing operation on sandy soils? yet it is applied indiscriminately to every portion of the valley land, within easy reach of its localities. Having submitted this substance for analysis by Mr. STEPHENSON, a practical chemist, I shall give his account of it, previous to my observation. He says, "I have carefully examined this very singular earth, and find that it is almost wholly composed of silicious matter, with a trace of alumina, not amounting to one per cent. It does not contain the least particle of calcareous or other saline matters, I cannot account for its employment as a manure on the Nepaul soils* although it might be used to renovate those in which carbonate of lime is redundant, or those in the composition of which silex formed but a small portion." Of its physical characters, he observes, It contains numerous particles of mica, from which I infer that the stratum i formed of decomposed granite which having been washed from the neighbouring hills, was deposited by the water floods in the subadjacent vallies.† It contains too small a portion of alumina to be used advantageously in brick-making; but I think it would form an excellent material for mixing with others, to form pottery ware. Indeed this earth is so fine in its particles, that I have no doubt it would be found an excellent material of itself for

* I had previously endeavoured to convey to him a correct notion of the nature of the soils cultivated in this valley.

† It is probable that this substance is very nearly the same as the porcelain granite, a substance composed of three ingredients, quartz, felspar and mica. The quartz in the porcelain granite is almost pure silicious earth in a crystalline form. In one substance the silicious earth is in the form of an impalpable powder; mica is abundant in one substance, but not perhaps the felspar. The mica is a compound substance containing lime and magnesia from the decomposition of which much benefit may accrue to the soil on which this m anure is laid.

pottery. It is, as Mr. S supposed, largely used in the manufacture of coarse pottery, generally combined with clay, and sometimes *per-se, and even in brick and tile-making, it is found useful* in combination with the several varieties of excellent *clay which abound here. When exposed in small cakes previously kneaded with water to the action of fire, it becomes hard, but semivitrified, and changes its colour to a light red, indicating the* presence of a small portion of oxide of iron. It does not effervesce with muriatic acid, nor undergo any change when exposed to the action of nitric acid. Its specific gravity is 1.98.* The second more commonly used natural manure is a species of orange coloured clay, having an admixture of the oxide of iron with a very small portion of vegetable matter, and entirely free from calcareous substances. This earth sometimes appears as an upper stratum, on the higher level of the valley, and is capable of yielding good crops of wheat, oorid, and gohya rice, but its most common position is that of a second stratum immediately under the ordinary clayey soils, and in the lower, as well as the higher level, although most generally diffused, in the former. This substance is exclusively applied to the renovation of sandy soils, and its nearly pure aluminous composition points it out as admirably fitted for the purpose. It is not regarded by the cultivators so much in the light of a manure, strictly so called, as in that of binding matter for adding consistency to soils which are too sandy. They say that after two years cropping, the more sandy lands become very light (hulka) and sapless, and that this yellow clay improves their constitution, fitting them for a new round of crops. Artificial manures are always applied when within the means of the cultivators, to soils previously dosed with this clay.

Burning turns it into a brick red colour; it does not effer-

* Burnt clay is used in some part of India, and has been tried in England as a renovator of soils. It is insoluble equally with our substance but absorbent and well suited for improving the texture of soils; but although the use of such substances had been proposed to the undervaluing of animal and vegetable manure, it is universally maintained that manures which *contain soluble* extract, or from which *it can be formed,* can alone maintain fertility for any length of time; our earth must possess the latter property.

vesce on the application of acids; muriatic acid diluted dissolves a portion of it, the solution becoming dark green, or almost blue, on the addition of prussiate of potass. It is generally free from sandy particles, but is often mixed with portions of mica. Its specific gravity is 1.78. It is largely used in brick and tile-making, as well as the manufacture of pottery ware. In the last case, it is mixed with the silicious earth previously described.

The importance of artificial manures is much more generally acknowledged in Nepaul than throughout Hindoostan, and their employment more common. But even here, there is no system of making manures practised as in England; nothing to correspond with our compost making: the utmost extent to which this great desideratum to agriculture is supplied being by the mere collection of ashes, and decomposed vegetable and animal matters, with an occasional addition of the slimy earth from the dried bottoms of small pools, around the towns.

In the valley proper, so entirely is the land occupied by cultivation, that there are scarcely any cattle at all grazed here between the months of March and December, from which peculiarity the sources of obtaining vegetable and animal matters for manure, are almost limited to the ashes of wood, (the only fuel used,) and human excrements. There are a few horses, as well as some cows and buffaloes kept by the better classes of the people all the year round, but there is no general system of cattle keeping by the farmers; and even the assistance of oxen in forming manures, which the people on the confines of the valley have from using the plough, is wanting in the valley where the plough is scarcely ever used, and where human beings are alone the means of transport.

The rice straw, and the sugar-cane after its juice is expressed, are consumed as fuel, by the poorer cultivators, by which the supply of vegetable manure is still more limited.

Principal varieties of soil recognized by the natives.—The Newars* class their fields under two grand heads, the place of

* Aborigines of the valley forming the mass of the rural population.

each field under each head being determined on, with double reference to the nature of the soil, and the facilities of regular flooding, and irrigation. The *Luckaboo*, or first class lands, and the *Wullaboo*, or second rate ones, are the distinguishing denominations, and every field within the valley admits of ready enrolment in either class.

The former may be characterised as land in which clay is predominant, which is rich in impalpable earthy and vegetable matter, and from its proximity to one of the rivers, a stream or permanent spring, is sure of being flooded annually at the commencement of the rains, and is capable of being irrigated during the cold season. In this description of land, the ground crop of the country, (the transplanted rice,) is annually grown, and it is besides, fit for the sowing of the wheat as a winter crop.

The latter class of lands may be either sandy or clayey; the regulator of their status is the supply of water. The soil of a field ranked as second rate, is commonly quite as rich, as those of the first rank, but from a lesser certainty of flooding or difficulty of irrigation, they are far inferior in value. In short, they are not *sure lands*, for giving crops of the staple of the country; they are only fitted for the growing of the gohya, or sown rice, pulses, culinary vegetables, and the coarser grains, such as muki, murwa and phofur. The *Wullaboo* lands speaking generally, occupy a considerable portion of the higher level of the valley, the *Luckaboo* ones, of the lower. There is a third description of lands denominated by the Newars *Poomboo*; these are swampy and wet all the year round; they yield excellent crops of transplanted rice, and are consequently very valuable, but from an excess of water are unfit for the growth of wheat or any second crops. Indeed these fields, to speak generally, lie fallow during the winter and spring; the drier ones of this class however give a crop of garlic, but not a very good one. This plant, the garlic, in Nepaul appears to affect moisture exceedingly, as during its growth there is generally six inches or more of water, kept in the fields under it. Stagnant water such as that of the *Poomboo* lands, does not suit so well as the running and fresh water of irrigation.

The swampy lands are only found in the lower levels, and generally not far removed from the channels of the rivers, whose beds in some places are raised by the deposition of sand above the fields on their banks. This is well marked in the Dhoobi khola,* a mile and a half east of Cathmandu, where there is a good deal of swampy land.

The soil of these swamps is a mixture of sand and clay, with a copious admixture of black slimy vegetable matter; they seldom, if ever, require manure, and almost invariably yield luxuriant crops.

Land Measure.—The arable land in the valley, as well as in the hills is purchased, rented, or assigned under the denomination of khets or fields, the component parts of which are ropunis and janas; thus 4 janas, 1 ropuni; 25 ropunis, 1 khet. The equivalents of these measures in English and India land measure are as follows: An English acre contains 4,840 square yards, the Nepalese jana is 75 square yards, the ropuni 300 square yards, and the khet's superficial surface is 7,500 square yards, or equal to one acre, 2 roods, 8 poles, and 18 yards. The bigah of Tirhoot, Sarun, and the Nepalese Turai is composed thus: Five poles or lugees, each nine feet long by four, make one kutta; 20 kuttas 1 bigah, or 1,200 superficial square yards. Hence a khet is equivalent to 6 Turai bigahs and 5 kuttas.† The khet of 25 ropunis was, previous to the Goorkha conquest of Nepaul, the only one known; but in more recent times, a khet of 20 ropunis has come into general use throughout the portion of the valley held by the Government as a royal domain. This practice was instituted for the purpose of more readily equalizing the emoluments of the Government servants, who are paid by assignments of land; *a khet*, or a certain number of khets, being the regular pay attached to different officers; and the lands of the valley being much more valuable than those of the hills, a diminution to the extent of 5

* Khola means the valley of a stream or river.

† It is not meant to be understood that these are the *precise* equivalents but they are believed to be sufficiently correct for the present purpose of composition between the produce, and value of land, here and in the Turai and plains.

ropunis or $\frac{1}{5}$ of the valley khets, approximate them more nearly to those of the mountains in which the measurements remain as before, each field consisting of 25 ropunis. There are throughout the hills, and even in the valley, other measurements in use than those above mentioned; the variations from the standard being made with reference to the richness of soils, and their average amount of produce. In some parts of the valley a khet may not contain more than 15 or 18 ropunis, and one in the hills may consist of 30 or 35, but the average produce of both will be as nearly as possible the same as the fields of the standard measurement. Land surveying is practised by the Newars as a separate profession, but unfortunately for the people at large, their art is kept secret; it is a hereditary one, and is accompanied by such evils as usually follow in the train of monopolised knowledge.

Average produce of land.—Grain in Nepaul is bought, sold, and its amount reckoned by measure only. Thus—

4	Choutays, ...	1 Mana.
8	Manas, ...	1 Patti.
20	Pattis, ...	1 Muri.*

The equivalents of these measures in the weights of our provinces, taking rice or wheat as the standard substance, are nearly as follows:—

8	Chataks, ...	1 Mana.
2	Manas, ...	1 Seer.
4	Seers, ...	1 Patti
10	Pattis, ...	1 Maund.
2	Maunds, ...	1 Muri.

The muri is about 80 seers of 80 tolas to the seer, and equal to 144 lbs. avoirdupois, or 180 lbs. troy. This will facilitate the drawing of a comparison between the relative productiveness of the soil in Nepaul and India. A comparison of the produce of a portion of land with the seed sown, although a common and correct enough mode, of estimating the relative fertility

* See the conclusion of these notes for a detailed and correct comparison of the Nepalese weights and measures with those of India and England.

of soils where broad cast sowing is practised, is not so applicable to drill husbandry, and is almost inapplicable to the husbandry of rice crops in Nepaul, whether they be of the Jahyah or seed sown variety, or of the malsi, a touli,* or transplanted sort. In broad cast sown crops, the seed is scattered generally, and thickly over the soil, leaving but small spaces between the grains; the consequence of this is that in lands of ordinary strength there are not more than 2 or 3 stalks growing from each seed, and in poorer ones, frequently not more than one *plant*. In drill crops the interspaces are so great, that it is not uncommon to see 20 or more stalks growing from one single seed under ordinary management and ordinary soil; while by "tillering," as the forcing of new stalks from the original plume is called in England, the number of stalks from one plant may be extraordinarily augmented, merely by the frequent throwing up of loose earth round the stalks. Sir HUMPHREY DAVY† says with reference to this, that he has seen from forty to one hundred and seventy stalks produced from a grain of wheat in a moderately good crop of drilled wheat, and that in 1,660, Sir KENELM DIGBY recorded "that there was in the possession of the Fathers of the Christian doctrine at Paris, a plant of barley which they at that time kept by them as a curiosity, and which consisted of 249 stalks springing from one root or grain, and in which they counted above 18,000 grains, or seeds of barley.‡ The sowing of the gohya rice in Nepaul is exactly analogous to the drilling of corn in England, as each grain of the seed is put in the ground separately by the fingers, in rows, and at fixed distances,§ giving room for the production of many stalks from each grain. Transplanted rice is also analogous to husbandry. It will therefore be necessary in comparing the returns, or *number* of *seeds*

* See Appendix for notices of these varieties of rice and their separate modes of culture.

† See his Agriculture Chemistry.

‡ I have counted 800 grains of malsi rice or plant of the variety as well as of the touli throughout, so far as my observation goes, from 3 to 12 stalks.

§ See Appendix for detail of agricultural processes. The gohya sowing is analogous to what is called dibbling in England.

produced in different countries, as a mode of determining the value of land, to keep in mind the mode of sowing practised with each crop.

I shall first enumerate the extreme and average number of seeds, yielded by broad cast sown crops in Nepaul, comparing the returns with similar crops in the Turai and plains, and afterwards treat of the transplanted crops in the same manner, leaving a comparison of the gross produce of similar measurements of land in these different places to the sequel of this heading as the most convenient and obvious data from which to draw a conclusion on the relative value of lands.

The customary quantity of wheat seed sown in Nepaul is one patti per ropuni. The produce from which varies from one muri, to 15,10, and 8 puttis according to the quality of the soil, and the nature of the season. Sometimes, but rarely, 1½ muri is yielded by a ropuni; 8 pattis is considered the minimum.

The range therefore is from 30 seeds as a maximum to 8 as a minimum; 20 seeds is considered an excellent crop; 15 a fair one; all below that, indifferent or bad. Taking 20 seeds as the usual maximum, and 8 as the minimum, we have 14 as the mean produce.

Of Indian corn (muki) the customary seed is 3 manas per ropuni, the produce ranging from 25 to 20 to 30, and 15 pattis. Here we have 66 seeds, as a maximum return ; 40 as a minimum, and no less than 53 seeds as the mean produce.*

The leguminous plants which furnish the different varieties of dal, the chief of which are kerow, masoor, oorid, and moong,† yield smaller returns than the grains above enumerated. Of kerow the allowance of seed per ropuni, is 1 patti and 2 manas. The average produce, 12 pattis, or 10 seeds; the seed grain of masoor is 6 manas per ropuni; its average produce 10 pattis, or about 13 seeds ; of moong, oorid, gahut and bhutwas, the average returns do not exceed 10 or 12 seeds.

* The allowance of seed for murwa crops is 4 manas per ropuni. The produce 22, 15, and 12 pattis, giving 44 seeds as a maximum, 24 as the minimum, and 34 seeds as its mean average produce.

† For Botanical names and other details see Appendix.

Broad cast crops of the Turai.—In the Turai lands wheat is scarcely ever grown, the flatness of the country, together with its numerous springs of water, rendering the lands too wet for this grain, and suiting them better for rice. The quantity of rice seed when sown broad cast, is from 30 seers to 1 maund per bigah. The produce ranging from 20 to 60 and even 80 maunds, giving 100 seeds as a maximum return, 60 as a not uncommon one, and 50 as an average. The leguminous plants in the Turai return from 10 to 20 seeds, seldom more.

In the western portion of Tirhoot,* the usual quantity of wheat seed sown per bigah is 40 cutcha *seer*, the return from which varies from 5 to 25 pucka maunds.† The minimum at 7, the maximum average is 28 seeds; the mean average, 21 seeds. By this mode of calculating, we have considerably larger returns from wheat in the plains than in Nepaul, a result in exact accordance with the general opinion of all classes of the people in this country.

The rice seed sown per bigah, broad cast, in Tirhoot, is 21 cutcha seers. The return ranging from 7 to 50 pucka maunds. The maximum average return is reckoned at 30 maunds, or 80 seeds; the minimum is 12 seeds, and the mean average amounts to 46 seeds.

The leguminous plants yield much higher returns in Tirhoot than they do in Nepaul. The seed of masoor is 21 cutcha seer per bigah; the produce averages 10 pucka maunds or 26 seeds. The seed of chuna is 21 cutcha seers per bigah, and its average produce is 20 pucka maunds, or upwards of 50 seeds. Kerow, moong and others of the same family yield, from 20 to 30 seeds.

From the above details it appears that the produce of broad cast sown crops in Nepaul bears a smaller proportion to the seed sown, than in the Turai and Tirhoot, indicating less fertility in the soil of the valley, quoad the returns from a single crop.

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* Mr. Howell, of Kurnaul, in this district has favoured me with sundry particulars on these subjects, the correctness of which I have every reason to be assured of.

† The pucka maund is 56 cutcha seer, or 7 cutcha seer to the pusseri, and 8 pusseri to the maund.

As the amount of seed sown in the nursery beds, whence the transplanting takes place into the fields cannot be usefully compared with their produce, it will only be necessary here to show the amount of the latter from known measurements of land. This, as previously mentioned, applies with equal correctness to the gohya or upland rice of Nepaul.

Land, under transplanted rice, produces from 1½ muri to 5 muris of dhan, (unhusked rice,) per ropuni. The former is reckoned a very small return, the latter a full and heavy crop; 4 muris may be considered the average produce in favourable seasons of the best valley land.* Land under gohya rice yields from 1 muri as a minimun, to 3 or 3½ muris per ropuni as a maximum; 2½ muris of this description of grain may be reckoned the average produce in a good season. This year, (1836,) remarkable for the small quantity of rain which has fallen, shews the poorest returns known in Nepaul within the present century. I have it from good authority that in many parts of the valley the produce has not exceeded 1½ muris of transplanted rice per ropuni, and that in no part of it, has it exceeded 3 muris.

It is not easy to ascertain the usual and steady amount of produce from Turai lands. There is an immense extent of unappropriated land in this tract, in consequence of which the cultivators have a large choice in fixing on the scene of their labours; new lands here as elsewhere in rich soils, throw up for two or three seasons, most magnificent crops, with little trouble or expence to the farmer in their cultivation. Hence on the decline of the productive powers of the soil to an ordinary standard, the cultivator not unfrequently abandons his fields for newer ones.

The maximum returns therefore under this head may be considered as derivable only from the richest and newest lands, and not to be had from soils under constant cultivation. It is gene-

* I have been informed, (although I doubt the correctness of the fact,) that 10 muris per ropuni of malsi has been produced in Nepaul, and that over sundry fields and in the same year, this is *double* the amount I have given as the produce of a heavy crop. It is possible enough, but such exceptions to the usual course of things need not serious notice.

rally allowed that the soil of the Turai is a much more fertile one than that of Nepaul, and that the approximation, in the amount of their produce, (when they so occasionally approximate,) is to be attributed to the superior style of the Nepalese culture over that practised in the Turai.

The produce from transplanted rice in the Turai, ranges from 10 to 80, and even to 100 maunds per bigah. The latter is a very unusual quantity, and may be looked upon in the same light, as the extreme produce of ten muris per bigah, mentioned as being known in Nepaul. 20 maunds per bigah is a fair crop in the best lands under regular cultivation; 30 maunds an excellent one; and 40 maunds may be considered as a high *average* of the produce in a favourable season. 60 to 80 and 100 maunds per bigah are only known in single fields, and for the most part in newly cultivated lands.

In Tirhoot the maximum produce from transplanted rice does not equal in amount that of the Turai. 60 maunds per bigah is considered nearly the maximum in single fields, and under highly favourable circumstances; 50 maunds per bigah, is an excellent crop, and 40 maunds a high average. The bigah of Tirhoot and of the Turai being the same, (20 by 20 luggis of 9 feet 6 inches per luggi,) we find a very near approximation in the produce of the regularly cultivated land in these places. Let us now compare the gross produce of one crop from similar, (or very nearly similar,) measurements of land in Nepaul, the Turai, and Tirhoot.

	Produce of land in Nepaul per khet of 6 or $6\frac{1}{2}$ bigah in mu-	Produce of land in the Turai per bigah, in maunds.	Produce of land per bigah in Tirhoot in maunds.	Produce of Nepaul land in maunds per bigah.
Wheat,	25 15 10	not grown,	30 20 5	8 5 3
Broad cast sown rice,	none grown,	80 60 40 20 10	40 30 12 7	none grown.
Trans-planted,	250 125 100	100 80 40 30 15	50 40 15	80 40 30 25 20 8
Rice,	80 60 25			
Masoor,	14 12 10	not known,	12 10	$4\frac{1}{2}$ 4 3
Kerow,	15 12 10	20 to 10	12 15	5 4 3
Moong,	12 10 8	not known,	12 15	4 3 $2\frac{1}{2}$.
Chuna,	Scarcely grown,	do. do.	20 15 10	
Oorid,	14 12 10	not grown,	little grown	$4\frac{1}{2}$ 4 3
Bhatwas,	12 10 8	do. do.	not known,	4 3 $2\frac{1}{2}$
Murwa,	28 20 0	not grown,	not grown,	9 6 0
Muki,	31 25 10	not known,	not known,	10 8 6
Phofur,	25 20 15	not grown,	not grown.	8 6

The above gives the advantage to the Tirhoot soils over the Nepaul ones for the production of wheat, as nearly 4 to 1; to the Turai soils over the Tirhoot ones for broad cast sown rice; to the Turai lands, over Nepaul and Tirhoot for the production of transplanted rice, Tirhoot being the least productive of the three in this grain. Tirhoot land has a productive power by this return in the pulse crops, of nearly 3 to 1 above Nepaul. In the production of the sugar-cane, the Turai and Tirhoot have a decided superiority over Nepaul. In the latter 15 dharnis of goor per ropuni is reckoned a heavy return, and 12 annas per dharni an average price.* . This will give 45 rupees as the money value of the produce of a bigah of land under sugar-cane in Nepaul, in a good season. In the Turai and Tirhoot, the produce is considerably greater; a bigah of land in the former

* 25 ropunis 1 khet, and 6 to 61½ bigahs equal to 1 khet.

under this crop yielding frequently 100 rupees per maund of goor and jaggri.

In Tirhoot the money value of the produce of a bigah of sugar-cane ranges from 15 to 80 Sa. Rs. It may be as well to mention here, that whereas in the Turai and Tirhoot the very best lands are appropriated to sugar-cane growing, in Nepaul those lands only which from their elevated situation do not admit of flooding, are laid under this crop. It is true that some portions of these dry lands are as fertile, as some of those within reach of regular flooding; but no cultivator of Nepaul will plant sugar-cane, (however fertile the land,) in a field for which he can procure sufficient water for the nourishment of a rice crop.

Money value of produce.—It will be as well to give in this place a sketch of the usual rotation of crops previous to noting the money value of gross produce. Every portion of the arable lands in the valley, with the exception of the swampy ones, (Poomboo khets,) occasionally those under sugar-cane, yield two crops within the year, or during 14 months. It is unnecessary to recapitulate the varieties of land and the manner in which these regulate the nature of the crops grown. The following is the usual agricultural routine. In the least easily flooded and irrigated portions of the higher level or the driest lands of the valley, a crop of wheat, succeeded by one of oorid* is raised the first year of a rotation; the same is repeated the second year, and most commonly the gohya or upland rice followed by oorid, moong, or some one of the other pulses, concludes the rotation, which in the driest lands is generally of three years. In more moist lands of the higher level, the rotation is annual; transplanted rice followed by wheat, or gohya rice, followed by mustard, or radishes, or some one of the pulses.

In the best lands or those for which the cultivator can reckon securely on flooding, the rotation is also only of one year, and very little varied; transplanted rice, followed by wheat, or rice followed by mustard seed, or garlic. In the very swampy lands

* For sowing and harvest time of all crops, see calender appended.

an annual crop of transplanted rice only is raised, and this without intermission from generation to generation, within the valley; fallows are never granted to the land;* year after year the land is cropped and for steadiness of returns it is perhaps unexcelled in any part of the world. There are several trivial modifications of the above rotations in use, although these are the chief ones; for instance, wheat and Indian corn form the year's crops of dry lands; wheat, and ginger or turmerick also in dry lands. In moist and rich lands or in well flooded fields near the towns where manure is procurable, three crops are raised annually and repeated without variation for many years; thus wheat, and an intermediate crop of cucumbers, melons, or other cucurbitaceous plants, and the grand crop of transplanted rice. In these latter cases the manure is applied to the crop raised in the short interval between the wheat harvest and the transplanting season, a period of little more than two months.

It is necessary to arrange the amount of land produce and its money value under three heads, corresponding with the division made of lands previously.

1st. A khet of land yielding a crop of wheat and oorid annually for two years, and wheat with Indian corn, or gohya rice, with oorid the third year, may be rated to afford of gross produce 25 muris of wheat, and 14 muris of oorid per annum as a maximum, and say 20 of the former and 10 of the latter as a mean average. The money price of these two crops taking the average of the last 5 years, (preceding 1836,) will amount to rupees 150 for the maximum, and rupees 126 as the mean.†

2d. From the next class of lands yielding annually upland rice and wheat, the amount of each crop respectively may be reckoned at 100 muris of rice, and 25 of wheat per khet, as a maximum average, and 80 muris of rice and 20 muris of wheat

* At least land never lies fallow during the hot season. Winter following, it is practised on some of the lands to be laid down in spring with upland rice.

† For prices of grain, see further on. A Nepaul Rupee, in which currrency these calculations are made, is equal to 12¼ annas of Company's currency.

as a mean average, giving, (as averaged in the last paragraph,) a money value of one year's produce of 300 rupees as a maximum, and 240 rupees as a mean average.

3d. From the best lands yielding transplanted rice and wheat annually without interruption or fallow, we have as the *extreme* maximum of produce per khet 250 muris of rice, and 30 muris of wheat, as the mean average produce. This scale of gross produce will give us a money value, (averaged at the 5 years' price previously mentioned) no less than 620 rupees as a maximum average, and 280 rupees as the mean average money value of produce, per khet of 25 ropunis.

The money value of an occasional additional crop of vegetables ought to be added to that given as the value of produce of the best lands, but the price of such articles, and the amount of them produced cannot be easily calculated, nor is it of essential consequence to omit them. It is also unnecessary to distinguish between the money value of a year's crop from the two first descriptions of land, when that is wheat and oorid, or upland rice and wheat, as cultivated above, or when it is wheat and mustard, or upland rice, and radishes, garlic or ginger, the staple crops have been given, as their prices and quantities are more easily attainable, and it may be taken for granted that when the crops are raised at the will of the cultivator, the aggregate annual amount of produce of each rotation must be much the same.

TABULAR FORM OF THE ABOVE SUMMARY.*

	Money value of the annual gross produce of a khet of 1st class land.	Money value of the annual gross produce of a khet of 2d class.	Money value of the annual gross produce of a khet of 3d class land.
Extreme Maximum,	Nepaul Rs. 620	Nepaul Rs. 335	
Maximum average,	Ditto Rs. 350	Ditto Rs. 300	Nepaul Rs. 156
Mean average,	Ditto Rs. 280	Ditto Rs. 240	Do. Rs. 120

* The prices at which these averages are reckoned are 2 rupees per muri of rice, and 4 rupees per muri of wheat.

Money value of Land Rent and Government Tax.—Rather extensive subjects to be included under one heading, but as it is not intended to do more than record a few facts respecting each, their association is convenient.

It is generally allowed by the people that the price of land has risen extraordinarily within the valley during the last 33 years. The amount of this rise is variously stated; perhaps it is near the truth that it has doubled itself since 1816. At present 2,500 rupees per khet of 25 ropunis (100 rupees per ropuni) may be stated correctly as the maximum average price of the best and most productive lands, the price varying from that point, according to the productive powers of the land, to 40 rupees per ropuni, or 800 rupees per khet, of the above dimensions, taking the foregoing calculation of the annual money value of gross land produce as our guide, the following is the result of comparisons between the money value of *net* annual produce, and the purchase price. By *net annual produce* in Nepaul is understood one half of the gross produce. It is synonymous in use to *rent*, as it is almost the universal practice of the proprietors of the land to grant its use to the cultivator for one half the yearly gross produce.* The money value then of net annual produce or the proprietor's rent roll, (without deduction of the Government tax,) when multiplied into the prices of land, give us the following index to the rates of purchase.

First class.—Lands bought at 100 rupees per ropuni, or 2,500 rupees per khet, have been rated to produce as an *extreme* maximum, 620 rupees, as the money value of annual gross produce, or 310 rupees as the amount of net produce. This extreme rate of *produce*, with a maximum average of *purchase price*, gives us an outlay at 8 years' purchase. Lands bought at the same price yielding as a *maximum average* of *net* produce, 167 rupees, are investments at 15 years' purchase; and the same priced lands yielding as a *mean average* of net produce 140 rupees are investments at 18 years' purchase. This latter then may be consider-

* This meaning of the term rent is as nearly as possible ADAM SMITH's and Col. TORRENS's.

ed the mean *average* purchase rate of the highest priced lands. The mean of the three rates above stated which exhibit the *extreme maximum*, the *maximum average*, and the mean average, is 13 years' purchase. The minimum in all the calculations of produce and price, from the extreme difficulty of ascertaining them, have been omitted.

The second class lands are at present purchased for about 80 rupees per ropuni, or 2000 rupees per khet of 25 ropunis. The summary table of gross annual produce gives us 240 rupees as the money value of the whole annual produce of this description of land, or 120 rupees per annum as the *net* produce, which multiplied into the purchase money, gives something more than 16 years' purchase as the average of this class.

Without deduction of the government share and making allowance for crops at the minimum rate of production, we may, I believe, assume 20 years' purchase as the ordinary present standard of the money value of land in the valley of Nepaul.

The usual direct demand by the present government does not exceed 1-6th and is averaged at 1-8th of the *net* or 1-16th of the gross annual produce of the land. The indirect taxes accompanying the possession of land, such as occasional small presents to the raja and occasional labour without pay are necessarily taken into account, as an estimate even of their probable amount converted into money value, is beyond the warrant of my information.

Deducting the amount of the government tax from that of net produce, will add $2\frac{1}{2}$ years to the terms of remuneration from a land purchase; this will give us $22\frac{1}{2}$ years purchase or say 23 years as the state of the case.

Prices of produce.—Under this head I have but very few memoranda. It is generally stated by the inhabitants and sojourners that since their first intercourse with the Goorkha Governor of the country, (1792,) the prices of agricultural produce have risen enormously. The subjoined note,* exhibits an abstract record of the verbally expressed opinions of sundry

* See the end of the paper for this Note.

persons, along with a few circumstances which may possibly be brought to bear on the elucidation of the rise in price which has occurred.

The following are the present prices of agricultural produce and of sundry other necessaries.

Cathmandu Bazar Neerikh of grain, pulses, &c. &c. on the 1st December, 1836.

N. B. This year, from the scarcity of rain compared with the previous years, shews very high prices in articles of home produce.

Krishno Bhog, &c. fine rice,		at 16	manas	per Mohur Rupee.
Malsi, &c. coarse rice,		at 24	do.	do.
Dhan, unhusked rice,		at 60	do.	do.
Wheat,		at 38	do.	do.
Barley,		at 72	do.	do.
Murwa,		at 52	do.	do.
Muki,		at 56	do.	do.
Bhatwas,	unhusked,	at 48	do.	do.
Koorthi,	do.	at 48	do.	do.
Oorid,	do.	at 27	do.	do.
Moong,	do.	at 20	do.	do.
Mussoor,	do.	at 38	do.	do.
Arher,	do.	at 12	do.	do.
Chuna,	do.	at 10	do.	do.
Kerow,	do.	at 36	do.	do.
Oorid Dole,		at 26	do.	do.
Moong	do.	at 18	do.	do.
Arher	do.	at 11	do.	do.
Mussoor	do.	at 32	do.	do.
Chuna	do.	at 8	do.	do.
Kerow	do.	at 27	do.	do.
White peas,		at 13	do.	do.
Methi,		at 34	do.	do.
Mustard,		at 34	do	do.
Teel,		at 25	do.	do.
Phofur,		at 14	seers	do.
Potatoes,		at 1	maund	do.
Ginger,		at 20	seers	do.

Hu[illegible]	at	9	seers per *Mohur* Rupee.
M[illegible], (flour,)	at	14	do. do.
Atta, (do.)	at	16	do. do.
Ghee, ...	at	1	rupee per dharni.
Salt.	at	$9\frac{1}{2}$	manas per rupee.
Oil, (mustard,)	at	$3\frac{3}{4}$	seers do.
Tobacco leaves (imported)	at	$7\frac{1}{4}$	annas per dharni.
Tobacco .... do.	at	12	do. do.
Sugar-candy, (imported)	at	15	annas per dharni.
Sugar, do.	at	1	rupee per do.
Shokker, ...	at	7	annas per do.
Goor, ...	at	9	do. per do.
Honey, ...	at	12	do. per do.
Milk, ...	at	16	seers per rupee.
Dahee, ...	at	10	seers per do.
Khuwa, ...	at	$4\frac{1}{2}$	do. per do.
Almonds, (imported) ..	at	27	annas per dharni.
Raisins, do.	at	6	rupees per do.
Munakka, do.	at	$4\frac{1}{2}$	rupees per do.
Dates, do.	at	15	annas per do.
Walnuts, ...	at	80	pieces rupee.
Nuts, (imported)	at	1	rupee ——— per dharni.
Pepper, do.	at	1	rupee 12 annas per do.
Long do. do.	at	3	rupees per do.
Dry Ginger, ...	at	$3\frac{1}{2}$	seers per rupee.
Cloves, (imported)	at	6	rupees per dharni.
Goojgeraty Cardamomums,	at	14	rupees per do.
Country or Burri Elachee,	at	10	annas per do.
Mace, (imported)	at	10	rupees per seer.
Cinnamon, do.	at	12	annas per do.
Nutmeg, do.	at	5	rupees per 100.
Jeera, do.	at	7	manas per rupee.
Coriander, do.	at	27	do. per do.
Cali-zeera, (imported) ...	at	20	manas per rupee.
Soup, ...	at	22	do. do.
Assafœtida, (imported) ...	at	6	rupees per dharni.
Camphor, do.	at	$7\frac{1}{2}$	rupees per dharni.
Vermilion, ...	at	16	do. per do.
Hertal, ...	at	$2\frac{1}{2}$	do. per do.
Quicksilver, (imported) .	at	15	do. per do.

Copper, ...	at	4	*rupees per dharni.*
Brass, ...	at	3	do. per do.
Kansa, ...	at	$3\frac{3}{4}$	do. per do.
Iron, ...	at	10	annas per do.
Steel, ...	at	1	rupee 4 annas per do.
Tutanag, ...	at	1	rupee per do.
Roasting Fowls, ...	at	3	per rupee.
Chickens, do.	at	6	do.
Ducks, ...	at	3	do.
Fowl's Eggs, ...	at	100	do.
Duck's Eggs, ...	at	60	do.
Buffaloe flesh, ...	at	4	annas per dharni.
Fish, ...	at	$4\frac{1}{2}$	annas per seer.
Goats, ... from 1	to	12	rupees each.
Sheep, ... from 1	to	3	do. do.
Buffaloes, ... from 4	to	36	do. do.
Cows, ... from 6	to	12	do. do.
Bulls, ... from 4	to	10	do. do.
Burnt Bricks, ...	at	5	rupees per 1000.
Unburnt ditto, ...	at	8	annas per do.
Tiles, ...	at	1	rupee 8 annas per do.
Full grown male slaves,	at	80	rupees each.
Ditto female ditto, ...	at	100	do.
Boys, do. do.	at	40	do.
Girls, do. do.	at	50	do.

Additional Physical and marked Chemical Properties of the valley soils.—Although it has been attempted in the body of these notes to convey a correct notion of the general properties of the soils of the valley, it may be advantageous to add some particulars of a few specimens selected from different localities, with reference to their peculiar fitness for the growing of particular crops. These specimens shall be first noted in numerical order, with a detail of their more obvious qualities, as well as with some particulars of their essential properties, less obvious.

No. 1. A light grey coloured alluvial soil, taken from a field in the upper level near the western gate of the town of Patun, contains about three parts in ten of very fine sand; the remaining seven parts being clay and impalpable earthy matter does not

effervesce with muriatic acid; it is highly fertile, yielding annually splendid crops of wheat and transplanted rice.

No. 2. A very light grey or dirty white coloured soil, taken from a field on the higher level near the road leading to Sheopooree, half a mile to the north of the Residency. It is decidedly sandy, not containing more than two parts in ten of impalpable earthy matter.* Besides the fine sand entering into its composition, it has a considerable quantity of finely comminuted mica. It does not shew any traces of lime when submitted to the action of muriatic acid.

It is a fertile soil, (less so than No. 1,) yielding annually fine crops of gohya (upland rice) wheat pulses, and in some situations transplanted rice. Sir HUMPHREY DAVY proposes that soils containing quartz and mica may be denominated "granitic soils;" but although this one is abundantly micaceous, there is scarcely any quartz in it, and I shall reserve that name for another specimen.

No. 3. A dark grey coloured sandy soil of the lower level, taken from a field near the Bishumutti river, to the right of the road leading from Cathmandu to Balajee. It has, when not powdered, visible traces of carbonate of iron, reddish spots being interspersed on its surface. Muriatic acid does not shew the presence of lime in this soil, but when applied diluted to it, turns it into a greenish colour, dissolving a portion of it, the solution diluted with water turning into deep blue, on the addition of prussiate of potass, thus indicating the presence of iron. Micaceous particles are numerous in this soil, as they are indeed in almost all the soils of the valley. This soil is most fertile, yielding annually very heavy crops of transplanted rice and fair wheat crops.

No. 4. A light red coloured clayey soil of the higher level. The specimen bearing the following characters was taken from

* The finely divided matter of soils is generally of a very compound nature, containing often all the salts of soils, some of the primitive earths, as well as animal and vegetable matter, besides the peculiar enriching substance called Humus by modern analysists. The aggregate amount of impalpable matter settles the fertility of any soil, but it requires correct chemical analysis to ascertain the proportion of each substance.

a field to the left of the road leading to Sheopooree, (near the bamboo plantation). It is with great difficulty reduced to fine powder; it contains about four parts in ten of sand, which is separable by frequent washing in water, effervesces slightly with muriatic acid during which a portion of it dissolved in prussiate of potass added to this solution gives a bright blue precipitate, indicating the presence of iron (carbonate of.) This description of soil yields good crops of Indian corn, and murwa as well as average ones of wheat, but is not suited for rice crops. Sugar-cane is frequently grown in this sort of soil, from its generally occupying situations on the higher level not favourable for being flooded.

No. 5. A brick-red ochrey clay, abundant on the north and east faces of the Nagarjum mountain, as well as in other places along the confines of the valley. It is much used by the Parbutteahs as a water paint for the out and inside of their houses, &c. called by them, par excellence, ratto matti or the red earth. It is not suited for profitable cultivation, yielding only very ordinary crops of murwa and Indian corn It is free from sand, and nearly so of impalpable earthy matter, being pure clay, strongly impregnated with iron. It is, strictly speaking, a "ferruginous clay," scarce meriting, in an agricultural sense, the name of soil.

No. 6. Is the yellow clay used as a manure which has been already described; when finely powdered it is of a greyish yellow colour like a mixture of rhubarb and jalap powder; when forming the superficial stratum, it yields fair crops of wheat and pulse. The presence of iron given as a character of it in the beginning of the paper is not constant, although general.

No. 7. Is the bluish black manure previously described. It so rarely forms the upper stratum, so as to afford opportunities of cultivating it alone, that its properties need not be further noticed; when beat into fine powder it is of a fine slate blue. It is not affected sensibly by muriatic or nitric acid.

No. 8. A yellowish grey coloured soil from the lower level in which it is very generally diffused. This specimen was taken from the banks of the Bishumutti river near Cathmandu. It is abundantly interspersed with minute portions of mica, and has

sand and clay in such equal portions as to render its classification difficult. It is rather more sandy than clayey, has no traces of iron or lime in it. It is very fertile, yielding excellent crops of wheat and transplanted rice, and is only inferior in fertility to numbers 1 and 3 of this list.

The most remarkable circumstances connected with these soils, which are specimens taken from the different varieties of cultivated land in more than half the valley, is the complete absence of lime, only one specimen (No. 4.) shewing the slightest traces of it.

The property possessed by some soils of becoming more heated by the rays of the sun under all similar circumstances than others, is considered by Sir HUMPHREY DAVY to be one, a due attention to which is of the highest importance to the agriculturist and the purchaser of lands. This property and its converse one of slowly parting with heat, is considered by the same authority as exercising a powerful influence on the fertility of soils. As a general rule, those soils which are most susceptible of being readily heated by the rays of the sun, and at the same time have the property of not rapidly parting with their heat, are considered the most fertile ones. With the view of testing the valley soils by ascertaining their relative possession of these properties, I submitted portions of the eight varieties of soil above noticed to the following experiments. The result, although it accords to some extent with the previous knowledge I had gained of their relative fertility, is not so decisively indicative of it, as to lead to the belief that a thermometer could be considered a very valuable instrument to the purchaser of lands. It must however be kept in mind that although the temperature of the surface, when bare and exposed to the rays of the sun, is considered to afford an indication of the soil's fertility, this can only be useful during the spring, or until the plant is sufficiently grown to shade the ground; and that in countries like this, where the chief crop is an aquatic one, the above properties however distinctly manifested, are not of such importance as to render their consideration of essential moment. The best is however, although a very simple one, perhaps worth noting, for the satisfaction of the

curious in such matters. The numerals here used indicate the soils to which they are attached above.

No. 1, at a temperature of 55° Fahr. was exposed to the sun's rays for one hour, at the end of which its temperature was raised to 85° and after one hour's lying in the shade its temperature fell to 64°. It gained 30 degrees during exposure to the sun, and lost 21 while in the shade.

No. 2, was exposed at the same time, and the temperature rose to 86°, and fell under similar circumstances of time and place to 62°, gaining 31°, losing 24°.

No. 3, rose from 55° to 89°, falling after an hour in the shade to 63°, gaining 34°, and losing 26°. This soil exhibits the greatest rise of temperature, and is to my knowledge the most fertile of all those experimented on; yet the difference is not very great in this thermometrical or thermal respect.

No. 4, had its temperature raised to 85°, and fell to 63°, gaining 30°, and losing 22°.

No. 5, rose to 86° and fell to 63°, gained 31°, lost 23°.

No. 6, had its temperature raised to 75° only, and fell to 62°, gaining but 20° and losing 13°. This is the clay manure, and it has preserved well in this case the *cold* character of the pure clays.* Its rise of temperature is 10 degrees less than that of No. 3, and while the other soils lost from 20° to 30° during their rest in the shade, it only parted with 13 degrees. It is however remarkable that all the soils fell to 62° and 64°. The temperature of the shade in which they were placed to cool, was 59°.

No. 7, rose to 48°, fell to 82°; gaining 29°, and losing 22°. This is the black manure and its more prominently marked property of becoming more heated than the yellow, coincides with its greater reputed value as a regenator of soils than No. 6.

No. 8, had its temperature increased to 86°, and fell to 62°; gaining 31°, and having lost 24°.

* The appropriateness of the common application of *cold* to clay soils is admitted by Sir H. Davy; they never retain an equal degree of warmth with sandy or loamy soils.

The maximum increase of temperature gained by these soils is 31°, the minimum 20°. The maximum diminution is 24°, the minimum 13°. In both cases 11° is the limit of range. The *richest soil treated in this manner by Sir H. Davy had its temperature increased from 65° to 88° by exposure for an hour* to sun-shine, while a poor chalk soil under similar circumstances was heated only to 69°. The richest soil experimented on by Sir Humphrey, lost in half an hour 15°, while the chalk under similar circumstances had lost only 4°. Our best soil lost in an hour 26°, while the poorest one under similar circumstances, lost only 13°. There is another property of soils which Sir Humphrey Davy has thought worthy of notice as influencing their fertility. It is the power of radiating heat, and which is best ascertained by observing the relative power of soils to absorb moisture from the atmosphere. Having submitted our soils to this test, I shall record the result, premising Sir Humphrey's opinions regarding the inferences to be drawn from the developement of this power. He says,* "There is a very simple test of the cooling or radiating powers of soils, the formation of dew upon them, or their relative increase of weight by exposure to the air, after being dried in the day or night in sun-shine or in shade. The soil that radiates most that acquires the greatest increase of weight, and of course the radiating powers of the soil are not only connected with its temperature, but likewise with its relation to moisture."

The moisture in the soil influences its temperature and the manner in which it is distributed through or combined with the earthy materials is of great importance in relation to the nutriment of the plant. If water is too strongly attracted by the earth, it will not be absorbed by the roots of the plants; if it is in too great quantity or too loosely united to them, it tends to injure or destroy the fibres of the roots. After laying down these principles, the same great authority says, "I have compared the absorbent powers of many soils with respect to atmospheric moisture, and *I have always found it greatest in the most fertile soils*, so

* See Agricultural Chemistry, pages 165-6.

that it affords one method of judging of the productiveness of land." It is unfortunate for the power of making comparisons with the results of his observations, that Sir HUMPHREY has recorded experiments capable only of being compared with one another; they were made on certain measures of soil while the quantity of water absorbed by them is given in weight; stated,* 1000 parts of a celebrated soil from East Lothian gained in an hour by exposure to air saturated with moisture at the temperature of 62°, 18 grains." The relation between 1000 parts and 18 grains not being given, it is impossible to make any satisfactory comparisons of our soils with those tested by Sir HUMPHREY. The absorbing power of six soils experimented on by Sir HUMPHREY, ranged as follows. The best gained in 1000 parts, 18 grains; the 2d, 16 grains; the 3d, 13 grains; the 4th, 11 grains; the 5th, 8 grains, and the 6th, a barren soil of Bagshot heath, only gained 3 grains. I weighed 100 grains of each of the 8 varieties of soil already noted, (their numerals here denote them as above described,) previously finely powdered and thoroughly dried simultaneously by exposure to the sun, and having placed each 100 grains on a piece of each, 2 inches square, laid them on a tin tray, which I exposed to the atmosphere during the night. At the time of their exposure the temperature of the air was 40° it fell during the night to 30°, at which temperature it was when I re-weighed the soils the following morning. The atmosphere was loaded with moisture, there being a heavy fog on the morning in question.

No. 1. (100 grains of) had gained 3 grains.
No. 2. (100 grains of) had gained 4 grains.
No. 3. (100 grains of) had gained $2\frac{3}{10}$ grains.
No. 4. (100 grains of) had gained 5 grains.

Shewing the maximum absorbing power of the whole. This soil, it will be recollected, is described as one of the higher level soils best suited for Indian corn, murwa and wheat, and for growing sugar-cane. Its non-adaptation for rice in the situation from

*See Agricultural Chemistry, page 169.

which the specimen was taken arising from a deficiency of water in its neighbourhood.

No. 5. (100 grains of) had gained $3\frac{2}{10}$ grains.
No. 6. (100 grains of) had gained $4\frac{1}{2}$ grains.
No. 7. (100 grains of) had gained $4\frac{1}{2}$ grains.

The maximum absorbing power of the valley soils is by this experiment represented by $1\frac{2}{10}$ to 100, the maximum by 5 to 100. The minimum absorbing power of the English soils above quoted is 3 to an unknown quantity, the maximum being 18. The range of the English soils is more extensive than that of the Nepaul ones, being as 1 to 6, the latter being as 1 to $4\frac{2}{10}$.

Wheats and Measures in use in the valley of Nepaul, with their equivalents in those of India; and English Troy weights, and fluid measures.

Bullion and jewellery are sold by smaller weights as in India, viz. the masha and ruttee and tola of 180 grains. All groceries and solid substances, except grains, are bought and sold by weight, and according to the following Table. The chief articles weighed by this Table are, sugar, tobacco, drugs, flesh, ghee, wax, iron, lead. copper, salt, soap and paper.

Parbutteah denominations.		*Newar denominations*	
$4\frac{1}{2}$ Tolas, ...	1 Kunna.	9 Tolas, ...	1 Bhuhul.
4 Kunnas, ...	1 Pau.	2 Bhuhuls, ...	1 Paulah.
4 Paus, ...	1 Seer.	2 Paulahs, ...	1 Baghula.
3 Seers, ...	1 Dharni.	2 Baghulas, ...	1 Koolan.
		3 Koolans, ...	1 Dharni.

The Nepalese tola weighs 165 grains English Troy weight, and from it is derived all the heavier weights (by Newars and Parbutteahs) up to the dharni, which is equivalent to 2 seers, 7 chattacks, 3 tolas of the British Indian ponderary system, the unit of which is called a *Tola* and weighs 180 grains Troy weight. See Prinsep's Table of weights and measures.

Nepalese weights.	British Indian weights.				English Troy weights.			
	seers.	cks.	tolas.	maras.	lbs.	oz.	dwts.	grains.
One Dharni,	2	7	3	,,	6	2	3	12
One Seer,	0	13	0	10.3 grs.	2	4	19	4
One Pau,	0	3	1	5.1 grs.	,,	8	,,	,,
One Kunna,	0	0	4	1.6 grs.	,,	1	12	12
One Tola,	0	0	0	11	,,	,,	,,	165

The Nepalese dry measure by which grain of all kinds, pulses, and oil seeds are bought and sold, is as follows, and is equally current among the Newars and Parbutteahs.

4 Choutays, ... 1 Mana.
8 Manas, ... 1 Patti.
20 Pattis, ... 1 Muri.

The standard choutay stamped at the Government mint, contains $2\frac{1}{2}$ fluid ounces, which makes the measure of the muri equal to 100 fluid lbs. of 16 ounces to the lb. Let us compare this measure with English dry measure; one quart English dry measure is equal to 32 fluid ounces.

English Dry Measure.

4 Quarts, ... 1 Gallon.
2 Gallons, ... 1 Peck.
4 Pecks, ... 1 Bushel.
8 Bushels, ... 1 Quarter or 256 qrs.

The muri being equal in measure to 50 quarts, is equivalent to 1 bushel, 2 pecks, and 1 gallon, or to $\frac{1}{5}$ and a fraction of $\frac{42}{100}$ of an English quart.

Grain being generally sold by weight in India, the equivalent of the Nepalese grain *measure* to the Indian grain *weights* cannot be correctly stated, as a measure of grain varies exceedingly in weight according to its quality. The following is the result of weighing Nepalese measures of several specimens of unhusked rice (dhan), rice, and wheat. The average weight of dhan was found to be 9 ounces Troy weight per mana measure, or 120 lbs. English Troy weight per muri, which is

equal to 1 maund and 8 seers of the British Indian weights.* *The average weight of edible rice, (chaul,) malsi and of good quality, was found to be per mana measure 1 lb. 1 ounce, 7 dwts. and 12 grains, or per muri 179 lbs. 2 ounces Troy weight, being* equivalent to 1 maund, 13 seers, 10 chattacks, 3 tolas and 4 mashas of British Indian weight.

The average weight of good wheat was found to be 1 lb. 1 ounce per mana measure, or 173 lbs. 4 ounces English Troy weight, being equivalent to 1 maund, 29 seers, 3 chattacks, 1 tola and 8 mashas of the British Indian weights. The Nepalese fluid measures by which oil, milk, spirits, &c. are sold, is as follows. Its unit is called Basta by the Newars, and is equal to 1 ounce of English fluid measure.

Newar denominations.		*Parbutteah denominations.*	
2 Bastas make	1 Detachi,	½ Chattack equivalent to	1 Ounce.
2 Detachi, ...	1 Baffachi,	2 Chattacks, ...	½ Tukuni.
2 Buffachi, ...	1 Pauchi,	4 Chattacks, ...	1 Tukuni.

The Pauchi in Newar, and Tukuni or fluid mana in Parbutteah, are equivalent to 8 fluid ounces.

Table of equivalents in weight of the Nepalese grain measure of the Indian grain weight and English Troy weights.†

	Equivalent to Indian weights.					Equivalent to English Troy weights.			
	mds.	seers.	cks.	tolas.	mashas.	lbs.	oz.	dwts.	grs.
Nepalese Muri of unhusked Rice,	1	8	"	"	"	120	4	"	"
Muri of Rice,	1	31	10	3	4	179	2	"	"
Muri of Wheat,	1	29	3	1	8	173	4	"	"

* For the relations between English Troy weights and British Indian weights, see Prinsep's Table of weights and measures; 1 masha is equal to 15 grains.

† In round numbers we may reckon a mun of dhan, as equivalent to 120 lbs. Troy or 1 maund, 8 seers of Indian weight; a mun of good rice as equivalent to 180 lbs. Troy, or 1 maund and 32 seers of Indian weight, and 1 muri of wheat as equivalent to 174 lbs. Troy, or 1 maund and 30 seers of Indian weight.

Comparison of Nepalese grain measure with English dry measure both reduced to fluid lbs. and ounces;—16 oz. to the pound.

	English dry measure.			*Fluid measure.*	
	Bushel.	Pecks.	Gallon.	lbs.	Ounces.
The Nepalese Standard muri measure has an equivalent capacity to	1	2	1	100	

List of the Agricultural and Horticultural Productions of the Valley of Nepaul.

	Newari Names.	*Parbutteah Names.*	*Botanical or English Synonyma and Remarks.*
		Varieties of Rice,	Oryza sativa.
1		Krisha Bhog,	The highest flavoured of all the varieties and is reserved for the tables of the rich.
2		Sham Jeera,	
3		Til Kanchund,	
4		Bairani,	
5		Juderbeli,	
6		Malbhog,	
7		Psuri,	
8	Malsi,	Malsi,	A generic term for one of the varieties of transplanted rice; all the malsis are dark coloured, and have been introduced by the Goorkhas.
9		Jara Malsi,	
10		Sindoo Malsi,	
11		Katea Malsi,	
12		Rato Malsi,	Red Malsi.
13		Sheto Malsi,	White Malsi.
14		Dungsea Malsi,	

15		*Anundi Malsi,*	*The happy or propitious malsi. The second generic variety of transplanted rice, of which the Newars reckon 6 distinct ones all of which are whiter than the* Malsis Touli; it is said to have been introduced into the valley by the Goorkhas.
16		Touli,	
17		Ramsali,	
18		Jaroon,	
19		Sooghi,	
20		Toosro,	
21		Munsoora,	A long grained variety, not prized.
22		Doodraj,	A round grained one of high flavour.
23		Hukwa,	Partially fermented in the stalk, which is formed on the field soon after the crop is cut.
24		Sarwa,	
25		Poothwa,	All the grain which is separable from the sheaf by beating the latter on the ground is first laid aside, so that the Hukwa if not inferior in quality, is at all events less ripe.
26		Elossi,	
27	Gohya,	Gohya,	The upland rice.
28	Agha,	Agha,	This variety is cultivated as the Gohya, (viz. sown in rows and not flooded), and also transplanted as the Malsi and Touli.
29		Jeera Saree.	In seasons of little rain this one is much planted, as it grows and ripens more rapidly and requires less water than the Malsis and Toulis.

LEGUMINOUS PLANTS OR PULSES, AND VETCHES.

30	Moo,	Moong,	Phaseolus Mungo.
31	Moossu,	Masoor,	Cicer Lens.
32	Maia,	Mas or Oorid,	Phaseolus Radiatus.

33	Hakoo Maia,	Kalo Mas,	Phaseolus max.
34	Eeu Maia,	Rato Mas,	Phaseolus aureus.
35	Pau Maia,	Sheto Masa,	Phaseolus torosus.
36		Tilia Mas,	A smooth grained species.
37	Kaiboo,	Chunna (Grain.)	Lathyrus aphaca.
38		Rahus (Indian,)	Ocymum pilosum
39	Mooah,	Kelo Bhutmas,	Black Bhutmas, not grown in the plains.
40	Tooro Mooah,	Sheto Bhutmas,	I believe; nor are the white and orange varieties.*
41	Sheo Mooah,	Kaelo Bhutmas,	
42		Gorans Mas,	
43	Kolan,	Kelo Gahut,	
44	Tooilo Kolan,	Sheto Gahut,	
45	Eean Kolan,	Rato Gahut,	
46	Kegho,	Kerow,	
47	Tango Kego,	Bhotiah Kerow,	
48		Kesari,	Lathyrus sativus.

WHEAT AND OTHER GRAINS USED AS FOOD.

49	Chau,	Rato Ghuhun,	Red wheat, Triticum hibernum.
50	Polung Chau,	Sheto Guhun,	White do. Triticum æstivum.
51	Kanni,	Mukui,	Indian corn, (Zea. mays.)
52	Dushi,	Murwa,	Eleusine corocana.
53		Bajra,	Panicum spicatum.
54		Phofur,	A small millet like grain, much eaten in the Hills.
55		Sotea,	Trigonella fœnum græcum..
56	Mi.	Neethi,	

OIL SEEDS AND CONDIMENTS.

57	Harmo,	Til,	Sesamum orientale.
58	Hako Harmo,	Krishno Til,	Black variety.
59	Tooro Harmo,	Sheto Til,	White do.
60		Tisi,	Linum usitatissimum
61	Naloo,	Sun,	Crotolaria juncea.
62	Poka,	Sursoo (Mustard,)	Sinapis dichotoma.

* It is the same as the Bhoot of the plains which Piddington denominates Cicer arietenum."

63	Toora Eecka,	Sheto Sursoo,	Sinapis alba.
64	Too,	Kalo Sursoo,	Sinapis ramosa.
65	Soo,	Somph (Fennel,)	Anethum sowa.
66		Aulah,	Phyllanthus emblica.
67		Amultas,	Cassia fistula.

VEGETABLE ROOTS AND SPICES.

68	Aloo,	Aloo (Potatoe,)	Solanum Tuberosum.
69	Surky,	Pedaloo,	Gardenia uliginosa or pahops.
70	Loosy,	Kunkra,	Rottlera Indica.
71	Lohi,	Mooli (Radish,)	Raphanus sativus.
72	Eean Chussoo,	Lal sag,	Amaranthus Gangeticus.
73		Kulum sag,	Convolvulus reptans.
74	Michan,	Methi ke sag,	Leaves of the Trigonella.
75	Kuwa kucha,	Moola ke sag,	Radish leaves used as greens.
76	Polucha,	Palung ke sag,	Ditto ditto.
77	Thoosa,	Bhutavas ke sag,	Leaves of the Phaseoli, do.
78	Tookung,	Toriko sag,	Leaves of varieties of Mustard, do. do.
79	Paksa,	Bachai ke sag,	Greens.
80	Kucho,	Kela ke sag,	Leaves of this pulse (Kerow,) do. do.
81	Kobitoo Kung,	Kowbi ko sag,	Greens (Cabbage.)
82	Choossoo,	Chasoo ko sag,	Ditto.
83	Gosu Gund,	Dhunia ko sag,	Leaves of the Coriander sativum.
84	Subsu,	Somph ko sag,	Fennell used as greens.
85		Chichunda (Beet,)	Beta vulgaris.
86	Hee,	Turool,	
87	Fukum,	Kerkaloo,	Sweet Potatoe.
88	Negro,	Negro,	
89	Chong,	Tama,	
90	Bhooti,	Bori,	Symplocos picata.
91	Puthoo,	Thotnia,	
92	Fussi,	Fursy or Fulsa,	Grewia Asiatica.
93	Bowsi,	Lowka,	
94	Seemi,	Simi,	Dolichos (sp. not known.)
95	Doopolung,	Ghera,	
96	Owamookung,	Chaw,	
97	Llobha,	Shusun (Garlick,)	Allium sativum.
98	Teha,	Piaj (Onions,)	Allium cepa.
99	Multibhutta,	Mirich,	Capsicum frutescens.
100	Eean Mullibhatta,	Lalmirich,	Red Capsicum.

101	Massoo Mullibhatta,	Peelamirich,	Yellow Capsicum.
102	Wau Mullibhatta,	Golmerich,	Bird's eye chillie.
103	Rai Hullu,	Huldi,	Turmerick.
104	Paloo,	Adruk,	Common Ginger.
105	Koko,	Kukuir,	Cucurbita pepo.
106	Mook Badam,	Moong Phulli,	Arachis hypogea (ground nut.)
107	Gosohu,	Dhunia,	Coriandrum sativum.
108	Phusi,	Keera (Cucumber,)	Cucumis sativa.
109	Tushi,	Konkra,	Cucurbita lagenaria.
110		Kuddu,	Cucurbita melopepo.
111		Ramtoroi,	Cucumis acutungulus.
112	Kubuja,	Turbooja,	Cucurbita citrullus.
113	Bhutta,	Kariala,	Momordica charantia.
114		Tejpat,	Laurus cassia.
115	Yeala,	Eelachi,	A large indigenous Cardamomum.
116		Pipla,	Ficus Religiosa.
117	Khorasani,	Khorasani,	The large Capsicum.
118	Mullibhatta,	Miricha,	
119	Too,	Ookh (Sugar cane,	
120	Chitoo,	Sano Ghenra (smal var.)	tivated, the large white one, the large purple cane, and a small white reed-like cane. The latter is most common in the valley; its produce is poor compared with that of the others; but it is suited for the only description of soil allotted to its growth here, viz. a hardish clay or light sand.
121	Koosha Too,	Kalo Ghenra (purple var.)	
122	Ghewora Too,	Sheto Ghenra (white var.)	

FRUITS OF THE GREAT VALLEY AND OF LESSER ONES WITHIN THE HILLS.

123		Ananas (Pine Apple,)	Bromelia ananas. Ananas comes to the greatest perfection in the valley of Noa Kote.
124		Aum (Mango,)	
125	Phunsy,	Kathas,	The Jack fruit.

126	Kathaba,	Blue Kathaha,	
127		Shurripha,	Annona suriffa, *Roxb.* (Custard Apple.)
128		Goolabjaman,	Eugenia Jambos (Rose Apple.)
129	Kubsy,	Kaiphul,	A small red stone fruit, acid and astringent
130	Raspberry,	Hessalu,	Yellow and red Raspberry.
131	Sumtalasy,	Sungtola,	Orange.
132	Kela,	Kela (plantain,)	Many varieties and all of the finest flavour.
133	Ambasy,	Amba (Guava,)	Psidium pyriferum.
134	Chosy,	Chuksy,	
135	Goorij hamsy,	Jamoon,	Syzygium jambolana.
136	Singhaly,	Katoos or Amoora,	Amoora cucullata.
137	Mookhbadam,	Moong phulli,	Arachis hypogea (ground nut.)
138	Khosing,	Wokhur,	A wild fruit.
139	Pasy,	Mehel,	The Raeberry.
140	Tusy,	Bunrah,	
141	Dhale,	Darim,	
142		Anar,	Pomegranate (Punica granatum.)*
143	Toot,	Toot,	The Mulberry.
144		Anjeer,	Grapes.
145	Rusy,	Aurah,	A wild fruit like a plum.
146	Ekoosy,	Ekoosy,	A jungle fruit the size of a small orange.
147	Mutpiasy,	Mutpaisi,	
148	Bangephul,	Manakorosp,	
149		Nimbo,	Innumerable varieties of the lime, melon, citron and orange, including the bitter or Seville orange, and all of the finest flavour and delicious.
150		Seo (the Apple,)	
151		Behi (Quince,)	
152		Akrot (Walnut,)	

In addition to the above list of germiniferous plants barley, and oats may be added, the former is cultivated to a considerable

* The Botanical synonyma have been taken from Carey, Wallich and Piddington's Indian plants.

extent within the hills, and occasionally on the confines of the valley.

To the list of garden vegetables it is necessary to make further additions. It is sufficient to state that the climate is favourable to the production of all such as are known in Europe, and as the Horticultural calendar in preparation will shew the periods of sowing and maturation of all of them, it would be superfluous to dwell on them here. To the fruits enumerated, strawberries, raspberries, peaches, the wild cherry, the pear, apricot, nectarine, the fig, and a great variety of plumbs require to be added. The peach grows to a large size, but does not ripen in consequence of the short period of hot and dry weather between spring and the periodical rains. The apricot grows in every valley of the hills, but is small and of bad flavour. At Cathmandu, however, this fruit, raised from English grafts, is large and of excellent quality; strawberries are of fine flavour and the wild yellow raspberry is a favourite fruit of the Parbutteahs, who value it much on account of its supposed cooling qualities. Its flavour is good, but far inferior to our cultivated kinds. The English apple of all sorts thrives to great perfection at Cathmandu, where the flavour of "pipins" and "summer travellers" may be enjoyed nearly as completely as in Devonshire or New York.

In 1792 the prices of the principal grains were as follows:—Dhan, (unhusked rice,) 2 muris per rupee; rice, 25 pattis per rupee; wheat, 2 muris per rupee; muki, (Indian corn), 4 muris per rupee; murwa, 3¼ muris per rupee. In 1800 the prices were nearly the same as in 1792, and remained with little variation until 1816, when a war between Nepaul and the British Government terminated in the loss by the former of a considerable portion of its territory, when prices began soon after to rise, and have continued to do so steadily until the present time, when they are as follows: I take the average of the four years preceding this which is an unusually dear one; dhan, ½ muri per rupee; rice, 5 pattis per rupee; wheat, 5 pattis per rupee; Indian corn, 9 pattis per rupee; murwa, 10 pattis per rupee.

Grains.	*Price in 1792 and up to 1816.*	*Price of 4 years previous to 1836.*	*Difference.*
Dhan,......	2 Muris per rupee,	½ Muris per rupee,	4 to 1.
Rice, ...	25 Pattis per rupee,	5 Pattis per rupee,	5 to 1.
Wheat,......	3 Pattis per rupee,	5 Pattis per rupee,	8 to 1.
Indian corn,	4 Muris per rupee,	9 Pattis per rupee,	8½ to 1.
Murwa, ...	3¼ Muris per rupee,	10 Pattis per rupee,	10½ to 1.

This table exhibits an extraordinary rise in the price of produce within a very short space of time, (say 14 or 16 years), and although the prices of 1792 are not taken from official records, there is still good reason to believe in their correctness.* The rise in the price of wheat, Indian corn and murwa so remarkable, is endeavoured to be explained by the use of the former having been confined in 1792, and for long after principally to the distillation of ardent spirits, the Nepalese at that time scarce ever eating this grain. Indian corn and murwa were then eaten by the Bhoteahs, and the lowest caste of people; at the present time the press of population probably has forced a better class of people, (or large body of the people,) to feed on these grains. An efficient cause of the rise of prices since 1816, will probably be found to have had its origin in the concentration within the valley of Nepaul of almost all the Government officers, their dependants and followers, and of a large body of the army consequent on the loss of territory sustained by the war. These circumstances acting on a previous full complement of population in the valley and the impossibility of extending the cultivation, may be worthy of notice in an attempt to account for the rise in prices above noted.

An augmentation of the productive powers of the soil would doubtless have been sufficient for the supply of the increased demand without extending the cultivated surface, but it must be kept in mind that previous to the rise of prices, the agriculture was in a most efficient and forward state, and that to have augmented the return from the soils involved the possession as well

* Ramnarayan Sah, a very respectable merchant of Benares who has been settled here since 1791, furnished me with these items from his current expence book.

as the judicious outlay of available capital, the former of which rarely if ever falls to the lot of a Newar cultivator, and the latter is an occupation not suited to the usages of the Government or other proprietors. There is another and a powerful cause in operation. The Nepaul Government like all Asiatic Governments of the present day, and like all Governments of the world until very recently, strives strenuously to accumulate the precious metal within its dominions by enforcing strictly a prohibition against their exportation and by claiming a right to a monopoly of the purchase of all the silver bullion imported. This has tended greatly to increase the amount of coin, (silver especially,) in circulation, as besides the monopoly of purchasing the precious metals enjoyed by the Government; a further addition to its amount and a depreciation of its value is frequently made by recoining the currency and the reissue of it largely adulterated.

Thibet furnishes the greater part of the bullion (gold and silver) imported into Nepaul. On the arrival of this article on the Nepalese frontier it is weighed, registered, and its advent within the frontier reported to the authorities at the capital, where immediately on its arrival it is carried to the Government mint and valued by the officers of that establishment, without the proprietor having the option of disposing of his bullion to other hands, until the demands of the mint are first satisfied or of carrying it onwards to the markets on the plains of India. This silver bought in by Government at its own price, sometimes to my own knowledge at the rate of 8 annas per tola,* for the metal having a specific gravity of 10.4, (10.15 is that of pure silver,) is coined in the Cathmandu mint, and adulterated to such a degree as to reduce the intrinsic value of 100 Rupees of Nepalese currency to 78 Rupees of the Company's new currency, which is itself alloyed to the extent of 15 grains per tola of 180 grains.

Another source whence the Nepaul Government, or rather individuals connected with it, derive profits at the expence of the general weal, is the forcible retention in the country of the Company's sicca currency, which is received in payment of revenue

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* A tola is 180 grains and equivalent in weight to a Sicca Rupee.

and transferred to the mint at a rate fixed by the Government far below its market value, and being melted down is coined into the adulterated Nepalese currency. From all these causes, but especially from the restrictions imposed by Government on a free trade in the precious metals, it may be inferred that the standard of value, (silver) is unduly accumulated in the country. The money value, of grain, which has been shewn to have greatly risen of late years, is by natural consequence greatly effected by this circumstance.

Along with the rise in the money value of grain, that of copper coin has kept nearly equal pace, a circumstance of itself of some importance in establishing the fact of an overplus of silver coin and depreciation in its value. In 1816, copper coin sold at 22 gundas per rupee; now, (1836) a rupee will not fetch more than 20 gundas, a rise in copper, or fall in silver of 10 per cent. During the interval above alluded to, copper coin has been occasionally as light as 18 gundas per rupee.

Agricultural and Horticultural Calendar for the Valley of Nepaul, with other details connected with the subject.

Previous to entering on the detailed Calendar, it will be as well to give a brief summary of such agricultural operations as have not been noticed in the body of these notes. These are, 1st. Fences. 2d. Irrigation. 3d. Mode of laying out the ground or making fields. 4th. Tillage, or Manipulation. 5th. Implements. 6th. Different kinds of crops. 7th. General nature of the climate.*

FENCES.

The landed possessions in the valley, as well as the farms, (if a field or two deserve the latter denomination,) are so small, and the amount of grazing so trifling, that a regular system of fencing is neither required or practised. The whole of the valley being under cultivation renders the removal of the cattle from it during the crop season indispensible for their sustenance. So soon as the wheat crop is well up, and the return of spring has clothed the neighbouring hills with new grass, the cows belonging to the court, and its chiefs are removed to the mountains, where they remain in charge of their herdsmen and dairymen, until the removal of the crops in the valley, and the commencement of the winter on the mountains, induces the return of such of them, as are at the time giving milk. A very few cows, and buffaloes alone are kept in the valley during the crop season, and these are for the most part confined to the house in the villages and the outskirts of the towns. The number of sheep and goats kept in the village is so small during the crop season as not to merit notice. But the Nepalese cultivator, although relieved from the burden of guarding his fields from the inroads of useful herds and wild animals, has hundreds of Brahmuny bulls (let loose in honour of the gods, to prey on the helpless mortals) to

*The Routine of crops, the varieties and properties of the soils, the manners and varieties of produce, and its amount and price have been already noticed.

contend with for the fruits of his hard labour. These animals are an everlasting pest to the cultivator; he is obliged day after day to witness their ravage of his fields; to beat them is sacrilege, to kill them worse than human murder, and his only comfort for the loss of his grain by these animals is in the assured truth of the oft quoted, but to him bitter saying that the "Lord giveth, and the Lord taketh away." It is laid down by the brahmuns as an indisputable truth that it is fortunate to have one's field frequently visited by these monsters. Against this there is no appeal but fencing. There are, however, no permanent fences, unless the perpendicular side of a bund or water course can be so called. The only fence in use, is a temporary and annual one; it is formed of the nirkut (Arundo Tibialis) a slender rapid growing reed, which is annually planted along the edges of the fields, the situations of which near high roads, or in dry lands renders them more favourable to the inroads of the bulls than others. The nirkut is planted, in joints like the sugar-cane, in April and May; in a month or so, it is 2½ feet high, when a running warp of grass rope, binds the reeds together, to form the fence. The strength of the nirkut fence, is in its weakness; it yields to the pressure of an animal's chest, but recovers its erect position immediately. After the crops are off the field, the nirkut is cut, and used as fuel by the cultivators.

IRRIGATION.

The general unevenness of the valley's surface renders the progress of irrigation, as complete, as it is easy of accomplishment. It consists solely in taking advantage of the natural facilities afforded by the innumerable streams and small rivers, which rising in the mountains which surround the valley, or from their basis, seek a passage to the least elevated parts in which the two principal rivers have their course. The cultivator has but to ascend a short distance along the course of the stream most convenient to his fields, and thence cutting a channel to direct a supply of water on them, sufficient for his wants. Irrigation from wells is unknown and unnecessary in Nepaul, and although there are a few tanks within the valley, their water is never used

for agricultural purposes. Such is the facility of irrigation and the abundant and steady supply of water from the springs, that in a country, the staple grain of which is rice, there is scarce a famine on record, nor in seasons of the greatest ordinary drought, need any serious fears be entertained of a general failure of crops. In seasons of ordinarily abundant rain, irrigation is unnecessary for the growing of the transplanted rice crop, so that it is usually limited to the cultivation of the upland rice (gohya) mustard seed, garlick, radishes, and more rarely to the wheat crop. When the periodical rains are late of commencing, scanty during their fall, the most strenuous labour of the husbandman is turned to general irrigation, and so perfect are the arrangements of the Newars in this department, that every field on the lower level, and a large portion of those on the higher one, can be supplied with water sufficient for sustaining the life of the crops; until the rain becomes abundant. It would be tedious to enumerate the variety of plans employed by them for conducting the water of irrigation; every natural elevation is taken advantage of to dig a water course along its sides, and when it fails, a bund or artificial raised way is constructed for the remainder of the passage. The cultivators, whose fields are within reach of the waters of an artificial offshoot from the streams, unite their labour for its formation and preservation, and share its waters among them according to previous arrangements. Sometimes the fields nearest the source of the water course are first supplied; at other times, and when water is scarce, it is agreed that each field belonging to the little association shall have so many hours of water, taking it in rotation. So admirably is their irrigation managed, that the channels of permanent streams are often dry for days together, until it is necessary to restore the course of the water to their beds, for the purpose of enabling the possessors of fields lower down on its bank, to supply their wants.

This abundance of streams so beneficial to the community, is the cause of occasional detriment to individual interests. The streams rise very rapidly after heavy rain, often bursting their banks, and laying a coating of pure and barren sand over the

fields lying in the course of its emancipated waters. In many parts of the lower level the water courses are for long distances raised above the level of the fields on either side. It is in such situations that their bursting is so injurious.

MODE OF MAKING FIELDS.

The general inequality of the surface, together with the universality of a rice cultivation, renders terracing the obvious and indispensible means of retaining water on the arable land. A dead level is essential for the growing of a rice crop, and as this is the grand staple, it is a desideratum to qualify by levelling every portion of land, (fitted by the nature of the soil and situation) for bearing it. With very few exceptions arising from peculiarity of situation, such as the top of rounded elevations within the valley, and the very steepest portions of the mountain sides surrounding it, every inch of the cultivated surface is divided into flat terraces, varying in size according to the nature of the localities from 1 or 1½ acres, to 4 or 5 feet in length and breadth. On the declivities which mark the higher level from the lower one, the angle of ascent is so abrupt as not to admit of being terraced into the flats of more than 2 feet in the breadth, and it is not uncommon to see spots of smaller dimensions than this even under regular and thriving cultivation. The hill sides have the appearance of steps of stairs, rising one over the other and diminishing in breadth as they ascend until at the summit they vanish into spaces so small, as to be incapable of growing more than a dozen plants of rice.

After levelling, the next process in field or terrace making, is the raising of a border round the flat for the purpose of retaining the water. This border varies in height according to the situation of the fields, from 1 foot to 3 or 4 feet. The former is the usual height on the more even parts of the lower level, the latter common in very sandy situations close to the beds of rivers, and is in a great measure accidental, as the varieties of rice cultivated in Nepaul do not require more than one foot or 1½ foot of water, for their due nourishment. In very sandy soils, it is an object to retain the maximum quantity of

water in the flats, while in rich soils 9 inches or one foot of water is quite sufficient. Each flat is made to retain all the rain water falling on it, until it rises to the required height, when a small depression is made on one or two parts of the border ridge, to admit the escape of these superfluous waters, which flowing into the next lower flat is thus permitted to find its way to the nearest stream or river. The elevation of the border ridge prevents in a great degree the carrying off of the soil; although with the greatest possible care there is a good deal of finely divided earthy matter held in suspension by the water which along with all that is soluble, eventually finds its way to the rivers and is lost to these fields for ever.

TILLAGE OR CULTIVATION OF THE SOIL.

The simplest cultivation is that of the spade, the hoe, and the rake, and on a small scale it is the best; but spade husbandry cannot be carried to a great extent without employing more hands than can be spared from other occupations. The plough drawn by oxen or horses, is the chief instrument of tillage, and has been so in all ages and nations, of which we have any records.* Granting that a consequence of spade husbandry is to employ a larger body of a country's population in the art of agriculture, than is consistent with the due advancement of their arts and general civilization, and premising that however ancient may be the use of the plough as the chief instrument of agriculture, and that its employment here is almost unknown, we may announce that the aboriginal inhabitants of this valley are neither more barbarous in their manners, or less generally civilized than their plough-using neighbours of India.

The truth however of the commencing lines of the above extract is no where better illustrated than in the valley of Nepaul, where the entire cultivation is performed by means of the kodalee, or large digging hoe, an instrument answering all the purposes of plough, spade and rake. The cutting edge of the kodalee is set at an angle of about 30 degrees with the handle, which is only

* Penny Cyclopœdia for 1834, article "Arable Land."

two feet long; its off end projecting 4 or 6 inches beyond the eye of the instrument. The digger, when using the kodalee, seizes the projecting end with his right hand, and the portion which may be termed the hand proper in his left, and raising the instrument above his head, brings it down with much force and precision making a stand cut in the soil of 7 to 9 inches deep. The detached sod he raises on the kodalee turning its upper surface completely downwards. There are two modes of turning up the soil practised, one used for what may be termed fallowing or the preparation of the soil, the other immediately previous to sowing the seed. The soil in the preparatory digging is generally turned up three or four successive times during the winter, and in broad ridges, or narrow beds of about 2 feet across, with intervening furrows of a similar breadth, and about a foot or more deep, the upper surface of each sod being laid over the base of the ridge, by which means the stubble on both is in contact, and most favourably situated for rapid decay, while the roots of the plants are completely exposed to the air. This is the process in the first preparatory delving of lands for spring sown crops. In the second delving, the ridges made in the first, change places with the furrows, rendering two cuts of the kodalee necessary, and two rows of sods, for the formation of the ridges in a second preparatory delving; this exposes to the air the roots contained in the lower stratum of the ridges formed in the first preparatory delving.

In the second description of delving, or that practised immediately before seed time, the ridges are all broken, and the surface of the field made level, as in the spade delving of an English garden.

The preparatory system of digging is not practised for all descriptions of crops, the quick succession of crops in some parts of the valley precludes it; for instance, in rice lands which have not been completely soaked during the rains or in those from the situation of which the water readily departs after the cessation of the rains, there is but one delving practised previous to sowing wheat as a winter crop. And in lands of the upper level which have borne the gohya rice, and are not

flooded at the time of cutting this crop in the end of August, there is not a moment to spare for preparatory delvings, as a pulse crop must be raised on them, and reaped before the end of November. In this latter description of land, it is common to see the female portion of a cultivator's family reaping the rice crop from one end of a small field, while the males are close at their heels turning up the soil for a crop of vetches.

It is for the two descriptions of the rice crop that the Nepalese cultivator labours to give his lands the full benefits of exposure to the air and water by means of frequent delving. When the usual routine of crops makes it necessary to sow upland rice, it is generally preceded by a crop of vetches, or by the touli variety of transplanted rice; when by the former, it is not considered so necessary to give repeated delvings, as when the latter is the immediately preceding crop. One delving and one flooding during the winter, is considered by the most industrious cultivator quite sufficient in the former case, and in many parts of the valley even this is not practised; the land being allowed to lie untouched during the winter. After touli, two or three delvings, and as many floodings as procurable, are given by the most industrious husbandmen during the winter to land in preparation for gohya.

A plough similar to the common one of India, and drawn by bullocks, is used along the confines of the valley, and to a small extent on the clayey, and dry lands within the valley, but the kodalee must be considered the grand implement in the tillage of this country. It performs in the lands of the Newar cultivator all the duties of the plough, spade, hoe, shovel and dibble of England, to which may be added its employment as the only implement by brick-makers and potters in preparing their clay, and by mortar compounders in their occupation.

When the stubble and weeds are rotten, and the practical dryness of the delved land admits of its being broken into smaller lumps than those turned up by the kodalee, the analogous process to our harrowing is gone through. It consists in simply breaking the clods by means of a wooden mallet shaped like a crutch, the operator using either end of the mallet, or strik-

ing with its surface longitudinally according to the hardness and stiffness, or otherwise, of the land. This crutch-like instrument is used by the labourers in a standing posture. A handle of $3\frac{1}{2}$ or 4 feet long being attached to the centre of the mallet, which is itself of oak or other hard wood, and a foot long, with a square diameter of 3 or 4 inches. The ends of the mallet are sometimes bound round with an iron hoop, but not generally. After this partial pulverization, the lands undergoing preparatory fallowing are flooded, when this is practicable, and allowed to lie under the mellowing influence of occasional frost, and the conjoined action of air, water, and the decomposition of their roots and stubble, until again ploughed, pounded, and flooded, or until the seed is sown in them. The above with the occasional application of natural and artificial manures completes the preparatory tillage for spring crop of rice and is gone through from the month of December to the month of April, when that crop is sown.

For the transplanted rice, the preparatory tillage is of two kinds. First, that practised on the swampy lands which do not admit of a winter wheat crop, and second, that practised on a much larger portion of the arable land which yields wheat, and transplanted rice within the year.

So soon as the swampy lands have lost so much of their waters as to be a little dry on the surface (say in January) they are turned up, as already described, in broad ridges. This throws the water into the furrows, and exposes the tops of the ridges to the air, while the soil of the furrow surface and the sides of the ridges are exposed to water. Having lain in this state for a month or two, the ridges are thrown into the furrows, the water taking their place. This turning up and exposure of all parts of the soil to air and water is repeated three or four times by the more industrious cultivators, during the interval of rest the land enjoys between the reaping of one rice crop and transplanting of another. The first of delving takes place in January, the last in June and July, when the transplanting commences. A great addition to the decomposed vegetable matter of these soils is annually made consequent on the preparatory delvings, as on

the arrival of spring, and during the months of May and June the vegetation on them is so rapid, as to clothe them in grass and weeds, in a very short time, all of which is turned down and completely rotted (the heat and moisture favouring rapid decay) previous to the planting of rice crop.

On the second description of lands, the preparatory tillage is very rapidly gone through. The rice crop being off the ground, every field calculated for giving wheat is once delved as soon as it is sufficiently dry, and with a partial breaking of the clods, the wheat seed is sown and carelessly covered in by a little more beating with the crutch-like instrument, after which it is no more attended to. This is the general course and takes place in December. In some parts of the valley, however, the wheat land is more carefully tilled; it has two delvings and as many pulverizations previous to being sown, besides a slight sprinkling of manure. The wheat sowing commences on the dry lands at the latter end of November or beginning of December, being finished during the latter month. On wetter lands it is not commenceed before the middle of January, or terminated before the middle of February.

The preparatory tillage for the transplanted rice crop where it follows wheat, is as rapidly gone through as for the latter when it succeeds the former. The wheat harvest being terminated almost in the middle of June, and the rice transplanting commencing early in July, time is left for only one preparatory delving, which is performed *immediately* the wheat is cut. This, with the delving and levelling of the fields at the time of transplanting, and the occasional exhibition of manure, forms the sum of tillage to this crop.*

The after tillage or weeding is very carefully performed in Nepaul in so far as the rice crop is concerned. It is all done by the hand in the flooded lands, and with the assistance of a small hoe in the drier ones, by which means the earth is loosened, fresh mould comes in contact with the stems, and the growth of the young plants is greatly facilitated and accelerated.

*For farther details, see cultivation of different crops, and the Calendar.

IMPLEMENTS.

Having in a previous memorandum* given a detail of the agricultural and other implements of the Nepalese, it is sufficient here to state generally that they are of the simplest design, and rudest construction. Man alone furnishing the means of transport in agriculture as in commerce, and the aid of wind, water, and steam, being as yet neglected in the useful arts, (save in the solitary instance of a primitive water mill,) it is obvious that but little attention had been paid to the saving of labour, by the invention of improved tools, or the efficient adoption of mechanical powers to the labours of agriculture. The hand, assisted only by a few simple weapons of wood and iron, suffices for the labour of the field and the barn yard. The back and shoulders, with a common banghy suffice for the transport of manure to the field and its produce to mill and market; while a rude and single lever without wheels, or other means for producing increased power, serves, when worked by human hands and feet, to answer the purposes of sugar-cane and oil presses. The agricultural implements are the following: tqosa, or sugar-cane press; chikon sa, or oil press; kodalee, or digging hoe; kurumghan, or crutch-like instrument for pulverizing the soil; chassa mughan, a thin edged wooden shovel used in levelling flooded fields, and garden seed beds; koo keetcha, a small broad edged hoe used for weeding the flooded rice; chong kooki, a sharp pointed small one hand hoe used in weeding the upland rice, and other drill crops; kooi, a clumsy wooden shovel used for spreading grain to the sun, and collecting it into heaps; koorpee, or scythe sickle for reaping; chan kummoo, or bhangy with baskets attached as in India; this serves the Newars as cart and waggon A stick 6 feet long serves as a flail; by its means, and by beating the corn sheaf on the ground the grain is separated from the straw. Lhusi ooh, a large wooden pestle and mortar, is used for husking grain.

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* Forwarded to Government in July last, and models of the whole deposited in the Asiatic Society's Museum.

DIFFERENT KINDS OF CROPS.

The details of the agricultural* calendar annexed, will necessarily furnish many particulars which belong more especially to this head of the subject. It will therefore be sufficient here to give a general outline only of the course of culture of the principal crops.

1. *Transplanted Rice.*

This crop, the grand staple of the country, is planted wherever a sufficient supply of water for its growth is procurable, and that without reference to the characters of the soil. Loomy and sandy soils under equal advantages of flooding, yield upon the whole, the heaviest crops; strongly marked clay soils giving inferior ones. When this crop succeeds wheat, it is planted after one preparatory delving, and the delving (or puddling) of the land which immediately precedes the transplanting. The puddling is a more correct than elegant term for this last preparation which is performed as follows: the rice plants previously raised in small seed beds having attained a height of 8 or 10 inches, and a fall of rain having flooded the fields, the cultivators repair in mass to the roping (transplanting) of their lands. Men, women and children of all ages, naked to the hips and relieving the burden of their toil by singing and laughing, commence the labour of the day by levelling the ridges with the kodalee into the furrows now full of water, after which by tramping with the feet, the soil and water are intimately blended, forming a superficial stratum of semi-fluid mud to the depth of the knee. When the rain falls heavily at the planting time there is about 4 inches of water retained on the surface of this muddy stratum, through which, and about 4 inches into the mud, the plants of rice are introduced at a medium distance of 8 or 10 inches apart.

The women and children perform this part of the labour, the men preceding them with the kodalee, and foot tramping, levelling and puddling the soil as they go along.

The transplanting may be performed with good prospect of a

crop, from the 15th of June to the latter end of July, but not later.

When transplanted rice succeeds upland rice, as is the case in some lands not capable of bearing two crops annually, or at all events more than three crops in two years,* it is planted after the land has had two or three delvings and pulverizations, or undergone what may be termed winter fallowing. The planting process is the same as above described. The touli variety however is most frequently planted in these lands which are generally on the higher level, or along the upper portion of the spaces between the higher and lower levels. In the flat lands of the lower level, the malsi variety is most commonly planted, as it requires the greater abundance of water. The malsis and toulis alike require flooding, but the latter in a less degree than the former, becoming in this respect a connecting link in the chain of crops, or a means of gradual transition between the gohya, or upland rice, (which flourishes without flooding), and the malsi, for the due growth and existence of which complete and continued flooding is indispensible.

The after culture of transplanted rice consists solely in hand weeding, which is performed by the cultivators while wading knee deep in the fields; to this may be added the practice of laying several plants together after the ear has appeared, and the crop is heavy, for the purpose of preventing its "lodging" or falling flat on the water.

All the white crops in Nepaul are reaped with the sickle. The transplanted rice is made into sheaves, and allowed to lie on the ground in that form for a day or two after cutting, when it is carried to a dry spot, and the riper portion of the grain thrashed out by beating the head of the sheaf on the ground, or by beating the sheaf with straight sticks. Flails are not in use, nor is treading the grain by bullocks practised.

The grain, after being thus thrashed, is dried in the sun and carried home in banghy baskets. The sheaves after being partially thrashed as above, are generally collected into small stacks

* See "Rotation of crops" and "Tillage."

on the field, and the top of the stacks covered up with sods, in which state they are allowed to remain for 6 or 8 days, during which time they have become heated, and the grain has undergone a partial degree of malting. The stacks being opened out, the sheaves are again thrashed, and the whole again separated and dried as in the first process. The grain thus treated is called *Hukwa*, and although undoubtedly inferior to the grain treated in the usual way, is relished by the people, and considered wholesome. The origin of this practice is ascribed to its having been discovered at some very remote period of time that grain which had been buried when fresh, for the purpose of concealment during some civil commotion, had undergone a sort of fermentation and remained otherwise undeteriorated for several years. The hukwa is never used for seed, from which and from the process it has undergone, it may be inferred that the living principle of the grain has been destroyed. It has a disagreeable smell until quite dry, and the rice, when boiled, has a brownish colour.

The straw of the rice crop is spread out to dry on the fields, and after the grain has been carried home, and the reaping finished, it is taken away to be used as bedding for cattle, thatch for the cottages of the poorest people, (the Newars almost all live in brick and tile houses,) and as fuel.

2. *The Gohya or Upland Rice.*

There is probably one-third of the valley lands annually under the cultivation of this variety of rice. It is sown during the latter half of April, and the early part of May, and reaped during the last week of August, and the whole of September. In the cultivation of gohya, the greatest possible attention is paid to the preparation of the soil, by reducing it to a great degree of fineness, as well as by the exhibition of manure, and by previous exposure of the land to the fertilizing influences of water, air, and frost. Whether the gohya succeeds a vetch crop, a crop of touli, or another gohya crop, the land to be sown with it in spring, is delved, pulverized, and watered (if practicable,) during the winter months of December and January. In addition to this, it

has, when suitable to the soil, a coating of the black earthy manure laid on during the winter, and when the cultivator can procure it, one of artificial manure immediately previous to the sowing. Early in April the manure previously collected in small heaps on the field is spread over it, and about the middle of the month a light delving is given; which, followed by careful pulverization, serves to mix the manure with the soil, to keep the former close to the surface and to render the field a dead level. Immediately the land is thus prepared, (not some days after, but simultaneously with the preparation) the seed unmoistened* is put in the ground by the fingers, and in rows 6 or 8 inches apart, the sowers covering up the seed as they advance by drawing the hand over each transverse row of seeds put in the ground. The gohya sower squats on his or her hams, with a small basket of the seed placed on the ground between the knees, and using the four finger and thumb of both hands, deposits the seed, grain by grain, or two grains together, at regular distances in the ground, commencing laterally at the utmost reach of the hands and moving backwards after each row of 6 seeds is completed, and the hands have been quickly drawn along the row for the purpose of covering them in. Nothing can be more advantageous for quick and equal vegetation than this process; the seed getting a bed in moist freshly turned up, and finely powdered soil, not one grain of it being left uncovered, nor one grain deeper set in the soil than its neighbours.

The after culture of gohya is as carefully and laboriously gone through, as its sowing; so soon as it is well above ground, the soil is loosened at the roots of each row, by means of the small one hand hoe, and any weeds which may have sprung up with it are carefully removed. This hand hoeing and weeding is usually repeated 3 or 4 times, and occasionally 5 or 6 times during the growth of the crop. So universal is this efficient and careful cultivation throughout the valley, and so essential is it considered for the procuring of a full crop, that the cultivator, who leaves his gohya unhoed and unweeded, is looked upon as a

* The joomla rice, which is nearly similarly cultivated to the gohya, is first moistened and allowed to germinate and then sown.

ruined sluggard; often repeated weeding and hoeing is considered as indispensible to this crop as flooding to the malsi, and toulis. "The more you weed and hoe the gohya," say the cultivators, "the heavier will be the returns of dhan, and the greater the produce of chaul, or edible rice from it." Not only the straw and ear are increased in size by it, but the more you hoe and weed, the thinner is the husk of the grain compared with its nutritious part." With the exception of the indigo cultivation in Tirhoot, and that of the poppy in Behar generally, I have never seen the culture of the gohya rice in Nepaul surpassed in efficiency, and I believe that it is but rarely equalled in any part of India, yet the crop is inferior to the transplanted rice which neither wants nor receives a tythe of this care, and is rarely weeded in very wet seasons. The reaping, thrashing, and drying of the gohya are performed as on the transplanted rice. Hukwa is made from it also, but in small quantities. It is of a whitish yellow colour in the ear, the touli is of a brighter yellow, and the malsi dark brown, or blackish. The gohya is considered very nutritious and wholesome.

3. *Wheat.*

There are two varieties grown in the valley, the rato or red, and the sheto or white kind; both however are winter wheats, and undergo a similar description of culture.

The wheat crop in Nepaul is sadly neglected, compared with the rice, and other crops. It is not a favourite food with the people, and until recently, (say within the last 20 years), was but little eaten by the inhabitants, its use being confined chiefly to the distillation of spirits. As soon as the latest rice crop is off the ground, viz. at the end of November, the wheat land is once turned up in ridges, the seed sown broad cast, and covered in very imperfectly, by partial breaking of the clods with the crutch-like instrument, which in this instance serves the purpose of harrows. In stiff clay soils the land is left in large lumps, the wheat sown, and with very little care in covering, it is allowed to take its chance.

As to the after culture of the wheat crop, it is as much neg-

lected as its sowings; it is not once weeded, nor are the cultivators at the trouble of fencing it in any way from the inroads of their arch-enemy, the brahminy bull, who, during the spring, and early summer, revels uncontrolled among the wheat fields.

The wheat sowing continues from the latter end of November, to the beginning of January and February, but by far the greater part is sown in December. The reaping season commences about the middle of May, and continues until about the 15th of June. The careless cultivation of this grain is in strong contrast with the admirable system pursued in raising the rice crops, and its produce is correspondingly inferior. The flour is not sweet, nor of high flavour, nor do the natives of the plains of India reckon it nearly so nutritious as that of Behar, or Hindoostan. There are a few local exceptions in the valley to this careless mode of cultivating wheat, but the above is the general system followed.

Summer wheat is cultivated on the higher elevations in the interior of the hills to the North of Cathmandu, especially in the Cachar or the tract of country lying along the basis of the snowy mountains, where it is, so far as my information goes, of superior flavour to ouse in the valley.

4. *Indian Corn.**

This very prolific and hardy grain, is sown on almost all parts of the higher level of the valley, not suited from scantiness of water for the production of rice, or for the growth of sugar-cane from poverty of soil. Along the basis of the mountains surrounding the valley, and in many places high on their sides, this crop is cultivated to a considerable extent. in the interior of the hills where unoccupied land is abundant, it is frequently grown as a first crop on newly reclaimed lands, and generally on almost every kind of soil with little previous preparation. In some parts of the hills in the immediate neighbourhood of the valley it is alternated with potatoes, while in the others, it is grown annually on the same lands to an indefinite period.

After one delving and pulverization of the soil, the Indian corn is sown in the latter end of May and early part of June, in

* See p. 236, Note 2.

drills, the seeds being laid at intervals of seven or eight inches in the drills and the drills an equal space apart. The drills are not raised as for turnip sowing, but consist merely of rows of the plant on a level surface; the seed distributed in this manner with the view of facilitating the weeding of the crop, not for the purpose of earthing up the roots which seems unnecessary. The Indian corn sowing resembles that of the gohya rice, in the careful manner in which it is performed, the sower depositing each grain in its place, having first dibbled a hole for it 5 or 6 inches deep with the small hand hoe. Each grain when deposited is covered up with the same instrument.

The after culture of this crop is performed with great care in the valley, but much neglected in the hills, especially on new and strong lands. In the former it undergoes repeated weeding during the first month of its growth, the earth being loosened round the roots at each weeding with the hand hoe. After the first loosening of the soil, which is performed as soon as the plants are fairly above ground, top dressing of ashes or other manure is given. By this mode the crop gets the immediate benefit of the manure, which otherwise, from the extraordinary rapidity of its growth, could not be obtained by it.

The commencement of the rainy season, which immediately follows the appearance of the Indian corn plants, gives further facility to the absorption of the nutritious portions of the manure, as all the soluble parts of it are presented, as the water sink into the ground, to their young and tender radicles. In the short space of 2½ or 3 months after it is sown, the Indian corn yields its produce fit for being eaten, and in 3 or 3½ months it is ripe and fit for being stored up. During the latter part of the rains (August and September) the poorer classes within the hills, and a large portion of the population along the confines of the valley live exclusively on this grain. The ears, or cones of it, pulled fresh from the stalks, are roasted plain in the ashes of the cottage hearth and eaten without further cooking, and highly relished. It is supposed to be an extremely nutritious and wholesome food. The reaping is performed generally by pulling the seed cones from the stalk, after which the former are heaped on a

rude scaffolding near the cultivator's house, or more commonly they are suspended from the branches of trees close by, where, exposed to wind and weather, the hard and tough sheath of the seed cones preserves the grain for many months uninjured.

The stalks with the leaves attached, often 12 feet long, cut by the sickles, are used as fodder for elephants, bedding for cattle, and as fuel. The Indian-corn crop within the hills suffers much from the inroads of bears (Ursus Tibetanus) which are very numerous in these regions, and extremely partial to this grain. The average return from this crop is seldom below 50 seeds, ranging frequently far above it.

5. *Murwa.*

Of this crop much need not be said in detailing the valley cultivation; it is principally raised within the hills, but also to a small extent on the worst lands of the valley and along its confines. It is a dark, grey coloured, round shaped grain, the size of a millet seed; the plant grows about 2½ or 3 feet high, and the ear or seed bearing portion of it represents the racemose mode of flowering, several plumes of equal length rising from a common centre. The murwa is of two varieties; one is sown broad cast in May and June on beds 3½ feet broad, with intervening furrows of about a foot wide and a foot and a half deep. The other variety is transplanted in June and July, on flattened terraces. It is a hardy grain, and although both varieties of it grow and ripen during the rains, they do not require constant flooding; hence the mode of sowing it in raised beds and its adaptation to the soils, and localities in many places within the hills, where the former is too poor to grow wheat, and the latter too steep to admit of terracing and flooding. The after cultivation is limited to a careless weeding soon after the plants rise above ground. The broad cast variety is reaped in October; the transplanted one in November. As a general rule, this grain is never sown on dry lands from which a crop of wheat, gohya rice, or sugar-cane can be produced, nor on flooded lands capable of bearing a rice crop. The natives reckon it less nutritious than Indian corn, and I believe it is the least wholesome grain used as food for man, in

this or any other country of Asia. I regret being unable to determine the botanical name of this plant, nor can I find its denomination in science, in any of the works within my reach.

6. *Oorid or Mas Bhutmas, &c. &c.*

The cultivation of the several leguminous crops of which the above are the chief ones, is nearly uniform in the detail, and the lands appropriated to them are of a similar quality and similarly situated as to the retention of water on their surface. Flooding is injurious to all of them, and they flourish best on rich but light and very sandy soils. Stiff clayey soils, although in situations precluding the retention of much superficial water, are alike unsuited to their growth, and due productiveness. The higher level is the general seat of vetch lands. They are all sown in beds about three feet broad, with intervening furrows about a foot or a foot and a half deep, and a foot wide.* The bed being previously formed, the seed is sown on it broad cast, and covered in by a layer of soil six inches deep, raised out of the furrow, and spread over it with the kodaiee or large digging hoe. The kerow is less deeply covered in than the oorid and bhutmas, to which two sorts this mode of sowing is more strictly applicable. Where the surface is too level to admit of readily running off the water, the furrow is made of the extreme breadth, while in lands having a gentle declivity it is seldom deeper than one foot, and often not more than nine inches. The vetches are rarely sown as spring crops; they are either sown as summer crops after winter wheat, viz. in the beginning of June, or as early autumn crops after the reaping of the gohya, or upland rice, at the very end of August, or during the first fifteen days of September. Oorid is more rapid in its growth and maturation than bhutmas or any of the other pulses; three months or so sufficing. The crop sown in May and June, is reaped in August and September; that sown in these latter months being harvested in Novem-

* The kerow is in some degree an exception to this rule, as it is often sown broad cast on level terraces with sticks stuck among it, for the tendrils to twine round.

ber and December. The bhutmas is sown at two periods, as well as the oorid, but its ripening is much longer delayed. An occasional small crop of this pulse is sown along with Indian corn in April, and reaped in October; the other and principal one is sown in May and June, and reaped in October and November. Oorid and bhutmas are often sown together in May and June, the former ripening in August and September, is then pulled up by the roots; and the latter which is then only in flower is allowed to remain in the ground until ripe in October and November. Double crops are not at all general in Nepaul, as they are in the plains; the above two instances being almost the only ones in use. The summer crop of oorid is less productive, but its dal is reckoned of higher flavour than the antumn one. The latter furnishes all of this article used in feeding cattle and horses, and is the only grain given to live stock in Nepaul. The after culture of the leguminous crops consists of repeated weeding with the hand hoe, and their reaping is performed either by pulling the pods from the standing crop, or by pulling the crop up by the roots, and beating out the seed, as already stated when treating of wheat and rice. The moong (phaseolus mungo) although much eaten in this valley, and that procurable here being of very fine quality, is not a produce of the valley lands. The supply is grown in neighbouring valleys within the hills, the elevation of which is much less than of this one, and in which the temperature is considerably higher. It it sown in those localities, I believe in May and reaped in October.

7. *Phofur.*

This plant which is cultivated within the hills to a very considerable extent, and pretty largely on the confines of the valley is, I believe, the same as the buckwheat of Europe.* The grain is triangular, and the size of small wheat seed. One variety of it is blackish grey, the other lighter coloured; both are much eaten by the hill people of all classes, and considered nutritious and wholesome. The blacker variety is said to have a slightly bitter taste; the lighter coloured one, to be sweet and higher flavoured. The phofur is eaten, made into bread, and also in the

* See p. 236, Note 1.

form of porridge, made with milk, or water, according to the means of the people. Boiled with milk it is reckoned very nutritious, and, cooked in this mode, is a favourite food of the Parbutteahs.

The phofur bread is reckoned rather indigestable. I have tasted it, but cannot laud its flavour or sweetness, it being in both respects inferior to Indian corn, barley, or rye.

The phofur cultivation is rather negligently performed, the soil receiving but one delving previous to the seeds being sown; and the after tillage as with the wheat crop, is almost entirely neglected. Phofur usually follows Indian corn, which is reaped in August and September, when the land is immediately turned up in narrow beds and the phofur sown broad cast over the beds and furrows, and covered in by breaking down the clods with the crutch-like instrument. It is an exhausting crop, while the Indian corn which precedes it, is considered a renovating one from the quantity of manure required in its cultivation. The phofur lands are always such as are not fitted for the raising of rice crops. It is reaped in November and December.

8. *Tori and Sursoo, (varieties of Mustard.)*

This crop raised principally for its oil, is cultivated here with the utmost possible care and labour. Loamy and clayey soils, on the lower level, are those best adapted to it, and from among these the richest portions are selected. During the months of October and November the tori and sursoo are delved, pulverized and irrigated two or three times, and the fields levelled. After the second or third delving and pulverization, a layer of either of the natural manures already described to the thickness of 4 or 6 inches is applied to the fields; they are flooded to the depth of 8 or 9 inches, and allowed to lie in this state until the water is absorbed and evaporated sufficiently to admit of the seed being sown. Immediately previous to sowing the varieties of mustard seed, the terraces prepared for them have drains about a foot deep, and 8 inches broad, dug in them at short distances from one another for the purpose of carrying off the superfluous water, as flooding is not congenial to these plants. A fourth delving, and pulverization is now given to these lands for the

purpose of completely incorporating the natural manure applied with the soil, immediately after which a sprinkling of cow dung manure, or wood ashes is laid on, and while the soil is fresh and moist, and the latest dose of manure is on its surface, the seed is sown broad cast, and covered in with dry and finely powdered earth thrown with the hand or shovel. In light lands a sprinkling of manure is occasionally given to the mustard crops, after the plant is two or three inches above the ground. The after culture consists of repeated hand hoeing and weeding. This crop, so carefully cultivated, is regarded as a regenerator of the soil, and serves the purpose of our green crops in England. It usually precedes a rice crop, either of the upland variety, or the transplanted kinds according to circumstances favourable or otherwise to flooding. The sowings of the mustard take place at two seasons. The first is sown in December, and reaped in May, when the land is immediately occupied by the gohya or upland rice. The second crop is sown in January or the early part of February, reaped in June, and succeeded by a crop of transplanted rice. There is a third crop of mustard grown in the neighbourhood of the towns which is not permitted to come to maturity; the plant cut when young, and used as spinach. All the varieties of mustard enumerated in the list of agricultural produce are favourites as green vegetables, and are considered among the most wholesome of the "saugs." The Patun division of the valley is considered most fertile in the mustard crop.*

9. *Garlic.*

This, the favourite vegetable condiment of the Newars, is so generally and extensively used in the valley, that it is necessary to include it among the field crops rather than in the garden ones. Moist lands on the lower level, are the best adapted to the growth of garlic. It is procurable fresh all the year round in the Cathmandu bazar, but in the valley generally it is sown during the months of November, December and January, and eaten fresh and in great quantity during the months of March, April and

* The Patun division of the valley occupies the Southern side of it being bounded on the West and North by the Bhagmutti River.

May. It seeds in May and June. Garlic is one of the regenerating crops, as it requires much manure, and very careful and repeated delvings of the soil for its due maturation. The garlic lands are regularly irrigated, and occasionally flooded over during the growth of the plant. In the valley of the Bhagmutti river, and in the neighbourhood of the town of Terni, 6 miles east of Cathmandu, this plant is said to attain its largest size, and its most wholesome quality. That raised about Cathmandu and Patun, is considered less mild, proving when eaten in such quantity as the Newars are wont to indulge in, too stimulating. The garlic season cannot be passed unnoticed in Nepaul by any person, whose sense of smell is at all unblunted by the use of the plant as food. So largely do the Newars partake of it, and so diffusive is its odour, that the air on the roads and wherever else the people are met with, becomes redolent of its smell, and the presence of an individual of this race in the house during three months of the year is almost unsupportable. It is eaten raw alone, or with rice; it is cooked in an innumerable variety of modes and pickled, and preserved with oil, acids and salt, in sundry fashions. A Newar's meal, however various the dishes, is never reckoned complete or savoury without garlic in some of the numerous forms in use; while one of the plain boiled rice, or parched peas is considered sufficiently palatable and wholesome if a small modicum of garlic accompany it.

10. *Til. (Sesamum Orientale.)*

There are two crops of this grain, which is cultivated solely for its oil, grown annually; one is sown as a first crop in April and May, and reaped in October and November, the other as an autumn crop after the gohya rice in August and September, and reaped in November and December. Its sowing and reaping seasons are the same as those of the oorid, and like it, it is sown broad cast on narrow beds, and earthed over with the kodalee.

11. *Ginger and Turmeric.*

These plants, so similar in appearance, are similarly cultivated. They are planted in beds about 3 feet broad, with intervening

furrows one foot, or a foot and a half in width, or in drills 8 inches apart, and in dry light soils of the higher level, generally after wheat, and as a regenerating crop. The wheat being off the ground, the ginger and turmeric lands are immediately delved. A layer of fresh vegetable or animal manure is laid over them, and the roots dibbled in with the hand hoe, in June and July. Both plants are ripe and ready for storing in November and December, but their roots are dug up and used fresh from the middle of August. The Nepaul ginger is reckoned by the people of the neighbouring plains of Tirhoot and Sarun of very high flavour, and superiòr to the produce of their own country.

12. *Radishes*

Are cultivated all the year in the valley, and grow to an enormous size, sometimes it is said acquiring the circumference of a man's thigh. I have repeatedly seen them of 12 inches circumference, and 18 inches long. The white kind is alone grown here. The red ones introduced into the gardens at Cathmandu from English seed, become white after the second year. Radish and Garlic share equally the regard of the Newars; the former, like the latter, is eaten in great quantities raw, and in every conceivable form of cooking and preservation. One mode of preserving the radish for food is, I believe, peculiar to Nepaul. When full grown, they are buried in the ground 4 or 5 feet from the surface, covered up and allowed to remain there for 4 or 5 days, during which time they undergo a species of acetous and putrid fermentation; when disinterred, they stink most abominably. They are carried to the nearest river, well washed, and afterwards dried in the sun, in which state they keep for many months, and are eaten with relish by almost all classes of the community.

In this dry state the radish is called Sinki. The principal crops of radishes are sown after the first rice crop is reaped in September, and after the later rice in November and December.*

* There is also a radish crop sown in May, after the wheat is off the ground, which is eaten during the rains. Radishes are procurable throughout the year in the Cathmandu market.

The season for preparing the sinki is during the months of March and April. The leaves of the radish are largely used as greens. Sinki is a favourite condiment in the portions of Tibet lying between the Himalaya and Lassa; and the practice of preparing it here, has in all probability, been introduced from that region along with many other customs and habits prevalent among the Newars.

13. *Sugar-cane.*

There are three kinds of cane grown in the valley; viz. a large purple cane, a large white one, and a small reed-like white kind. The purple one is considered by far the most productive in sugar, the large white one ranks next to it, and the small one is the least valuable of all.* Light soils of the higher soils are the usual situations for growing sugar-cane within the valley, but without strict reference to the nature of the soil, it is grown in situations not favourable to irrigation, and where flooding is im practicable. Wherever flooding is impracticable, rice is grown, as being the most valuable of all land produce; sugar-cane, and all other crops being considered of inferior moment to rice, and to be cultivated only where that crop cannot be raised, or where it may be raised in subordination to it.† The sugar-cane land is prepared by two or three winter delvings, and at the time of planting by being turned up into beds of three feet broad, and a foot and a half deep. A layer of manure is either delved into the beds, or spread over them after the cane is planted, according to the previous arrangements for procuring manure made by the cultivator. In planting the two large kinds of cane, the slips are placed a foot apart, forming two rows on each bed, while in planting the small reed-like cane, there are three, and sometimes four rows of slips put into each bed of 3 feet, or at most 3½ feet

* The purple and large white varieties ought not perhaps, strictly speaking, to be enumerated as agricultural products of the valley, as they are only grown in very small quantity in the gardens of the wealthy. The small white kind is the one unusually grown as a crop.

† Sugar-cane is grown in some parts of the valley and on its confines, alternatively with the gohya rice. Thus, one year, gohya rice followed by oorid or phofur. The next sugar-cane, as the only crop for the season.

broad. The first sugar planting of the season takes place in February, and it is principally that of the small variety. About a third of the cane crop grown in the valley is planted this month, the remainder being planted in March and April. The harvest of all these varieties takes place in November and December, when the cane is buried in pits on the field 12 or 14 feet deep, for the purpose of preserving it from the frost, and whence it is raised as required either for sugar making, or for sale to be eaten fresh.

Fresh sugar-cane is a very favourite food of the people of this valley; hence more than half the crop annually raised is consumed in this way. Almost all the purple, and large white cane grown, is eaten fresh; the small reed like cane alone being reserved for sugar making.

In addition to the sugar-cane grown in the valley, it is necessary to import a considerable quantity for consumption, fresh from the neighbouring valley of Noakote, (20 miles northward of Cathmandu), where from the lower elevation and greater heat, this plant is much more successfully cultivated than in the great valley. The cane of Noakote is principally of the larger kind, the purple one predominating; while in the great valley, the small reed-like cane is the most abundantly grown. The purple cane of Nyakote grows in a favourable season to the height of 10 feet, and 6 inches circumference, sometimes more; and the white one at the same place to the height of 8 or 9 feet, and 6 or 7 inches in circumference. These larger canes in this valley seldom attain the same degree of height or thickness. The small white cane is seldom above the thickness of the little finger, or higher than 6 or 8 feet, and is hard and juiceless to a great degree, compared with the larger kinds.

It is unnecessary to detail separately the mode of cultivating the remaining crops grown in the valley, as they have been already enumerated, and as their minor importance as articles of food does not require this notice being taken of them. If the described processes of agriculture have failed to convey a tolerably clear idea of the careful and efficient labours of the Newars, or to shew that in this, the first and most important of the useful arts, this people have made much more progress to-

wards perfection than those of the neighbouring plains of India, the fault lies in the imperfect manner of detailing the facts above recorded, which are vouched for as true, and are, I believe, more than sufficient to establish a claim for the Newars to a very high, if not the highest, place among the cultivators of Asia.

GENERAL NATURE OF THE CLIMATE.

1st. *Winds, Rains, Pressure of the Atmosphere and Temperature.*

Not being at present prepared to give a specific account of the climate of the valley from personal meteorological observations, it will be sufficient to indicate generally its character as it has reference to the productions of the soil.

The most marked characteristics of the valley climate, are its extreme humidity and the irregularity of the winds, as to direction and intensity. The former of these circumstances, arises from the retention of so much water as is required for raising rice crops, together with an annual average fall of 50 inches of rain water; and the latter, from the high mountainous boundary girding the valley, by which the currents of air passing over their summits are prevented from reaching the valley's surface. It is often difficult to ascertain correctly from what direction the wind blows, so calm is the atmosphere, or so irregularly do blasts from the mountains rush down into the subjacent plain. This calmness and irregularity in direction of the winds is most marked during the rains, and early part of the cold season, or from the middle of June to the end of January. From the beginning of February to the commencement of the rains, the wind blows during the day pretty steadily from the West, veering round to the North West at evening during the months of February, March and April, and to the South West at the same time of the day during the month of May and early part of June. From the commencement of the rains until their termination, the wind blows *generally* from the South, and South West; *occasionally* from the East, and South East, and very rarely indeed from the West or North West. After the cessation of the rains, which is generally simultaneous with that season in Behar, the

winds are more various, blowing occasionally from all quarters, but *most rarely* from the West, and *most frequently* from the North. A register of the direction of the wind kept at any one part of the valley would but ill suffice to ascertain accurately the course of the wind for the day throughout the valley generally. It is almost always observable at the confines of the valley that the wind blows from the mountains at evening, and although I cannot state the fact from observations made at the same hour in different parts of the valley confines, I have, when in these situations, so invariably observed the wind to blow from the nearest mountain, that I believe at evening during the dry and hot season especially, the wind blows from all points of the horizon into the valley at the mountain bases ; after which the currents of air are joined with the wind prevailing in the valley proper, with which they are carried along in its direction. The breezes which come rushing from the mountain sides after and about sunset, ought not perhaps to be noted in ascertaining the directions of the wind in this valley as they are doubtless no more than currents of denser air, descending to take the place of more rarified volumes of atmosphere, but as these winds sometimes extend for a mile or two from the mountains, they are apt to mislead, as to the direction of the actually prevailing wind in the valley generally. Spurs from the mountains, which form bays or subordinate valleys protect these spaces from the influence of the prevailing current of air to the distances above noted. The average annual temperature of the air in the valley approximates that of the climates of the Southern European countries: a circumstance which will explain the ready growth of the peach and pomegranate, wild and in the open air. The greater moisture of this climate than of those of Southern Europe, explains the wonderful fertility of its soil in raising rice crops.* The following abstract of recorded observations, although insufficient for the purpose of settling with precision the mean tem-

* The mean annual fall of rain north of the Alps is rated by MALTE BRUN at 25 inches. The fall south of the Alps at 25 inches. In this valley it was 50 inches in A.D. 1835.

perature and pressure of the atmosphere of the valley gives an indication of it which may be usefully referred to, in comparing the course of the season, and the round of agricultural employments here, with those of India and Europe.

The mean height of the mercury in the barometer during the month of January, 1837, calculated from daily observations at 10 A. M. and 4 P. M. and reduced to the 32d degree of Fahrenheit's thermometer was 25.448 inches. The mean of similarly made observations for the month of June, 1836, was 25.154. Taking these months respectively as those during which the mercury stands higher and lower than any others of the year, we have as the mean altitude of the mercurial column for the year, 25 inches, 301 thousandths or $\frac{3}{10}$ths.

It is remarkable, that the months which shew the greatest elevation and depression of the Barometer, should also exhibit *inversely* the highest and lowest degree of temperature throughout the year. The mean temperature of the air during the day outside and in the shade, for the month of June, 1836, calculated from observations taken at 10 A. M. and 4 P. M. was 78° of Fahrenheit's scale.

The mean of observations similarly made in January, 1837, was 47° of Fahrenheit's scale. The temperature of these two months, which exhibits the extreme of heat and cold during the year, gives as the mean annual temperature of *the day* at Cathmandu 62° of Fahrenheit's.* It is unnecessary to keep in mind here, that as no *night observations* have been quoted, the mean temperature of the 24 hours of these two months cannot be correctly stated, and further, that as the temperature of the day is at its maximum here, at 4 P. M. at which hour observations made have been quoted, the mean temperature of the day and night together, must be considerably below 62 degrees. The mean minimum temperature of January, 1837, calculated from observations taken by me from a self registering ther-

* The observations for June, 1836, above quoted are by Captain Robinson; those for January, 1837, by myself, but with the same instruments kindly lent by Mr. Hodgson.

mometer, exposed to the air in a western verandah, was 32° of Fahrenheit's scale. The mean maximum of observations taken by Captain ROBINSON at 4 P. M. for June, 1836, is, I find, 81°. If it is allowable to calculate the mean temperature of the year from the mean maximum of the day, during the hottest month, and from the mean minimum of the night, during the coldest month, we shall have 55° 3′ of Fahrenheit's scale as the mean annual temperature at this place. It is necessary to state, that this latter mode of striking the mean annual temperature is only given as subordinate to the first mode, as the mean minimæ taken by me, and the mean maxima by Captain ROBINSON were from different instruments. The result is nevertheless of some interest pending the collection of a more full and correct body of meteorological facts. The mean annual temperatures of the air in some of the Southern European countries as recorded by MALTE BRUN, affords a ready means of comparison between the climate of this valley, and the climates of those favoured countries. At Palermo, the mean annual temperature is rated at 62 degrees of Fahrenheit. The mean annual temperature of Lisbon is 60 degrees; that of Rome 59 degrees of Fahrenheit, and that of Paris 50°. The mean of these four climates gives a temperature of 55° $\frac{4}{5}$ which is the mean annual temperature (according to the more recent authorities than MALTE BRUN,) of Montpellier, the climate of which is unrivalled in Europe or out of it for salubrity to the human species.* The mean annual average of the day at Cathmandu, has been rated above at 62°. of Fahrenheit, and the mean annual temperature of the day and night at 55° 3′. By the first mode of calculating the average, we have at this place a mean annual temperature for *the day* exactly similar to the mean annual temperature of Palermo, while by the latter method, we have for the day and night a mean annual temperature corresponding to that

* For a notice of the climate of Montpellier, see a paper by Dr. ROYLE in the Asiatic Society's Journal, which is not at present within my reach. MALTE BRUN rates the mean annual temperature of Montpellier as nearly the same as at Rome, viz. 59°, but Dr. ROYLE from more recent authorities states it at 55°.

of the sanatarium of all Europe, Montpellier. It is probable, that a temperature between the two, may be found to give the most correct estimate of the mean annual temperature of this valley, say 58° of Fahrenheit, which correspond with the estimate now before me of the climate of Montpellier by MALTE BRUN. The following tabular view will render the comparison of these climates more easy.* Fractional parts of a degree not being of much moment in quoting the indication of temperature by Fahrenheit's scale, are omitted.

Table of Mean Annual Temperature by Fahrenheit's Thermometer.

	Valley of Nepaul during the day.	Valley of Nepaul for the day and night.	Palermo.	Lisbon.	Rome.	Paris.	Montpellier. By Malte Brun.	Montpellier. By more recent authority.
Mean Annual Temperature,	62°	58°	62°	60°	59°	50°	57°	55°

Course of the Seasons, with some of their more prominent distinguishing features.

The general characters of the seasons in this valley are, from its geographical situation, a good deal influenced by those of the neighbouring plains, but its elevation above them and its mountainous confines modify here the truly tropical character of the Tirhoot and Behar seasons to a close affinity with the seasons of the temperate zone. Cathmandu is

* Whether I am correct or not in stating the annual mean temperature of Montpellier at 55°, does not materially signify, as the recorded statement of MALTE BRUN making it under 59° brings its estimate so far as temperature is concerned, wonderfully near that of this valley

situated in the 28th degree of N. latitude, and has an elevation of about 4,800 feet above the sea; but as it is admitted by competent authority,* that 600 feet of elevation is equivalent to one degree of latitude, in affecting the temperature of the air and climate of a country, it is necessary in fixing the latitude, to estimate it at 36 degrees, as the parallel line, on other parts of the earth, with the climates of which that of Cathmandu should correspond. A comparison with those of MALTE BRUN'S "European Sections of Climates," which occupy the line of lat. 36, corroborates this doctrine in so far as the average temperature is concerned, and also in some respects as regards vegetation.

[illegible] in lat. 35.43, includes the peninsulas and islands of Greece, as well as Crete and much of the Mediterranean. Section 16 in lat. 36.44½ includes "the state of Genoa, Tuscany, the states of the Pope, Naples, Malta and Corsica." Section 17 in lat. $36.43\frac{3}{12}$ includes Spain and Portugal. In the first of these we have Palermo,† averaging 62° as the annual temperature. In the second, Rome, averaging 59°, and in the third, Lisbon, with a mean annual temperature of 60°. These temperatures correspond remarkably with ours, as do in some respects the vegetable productions of these countries. In the South of Italy, rice, oranges and myrtles abound. In the Mediterranean climate, "the scarlet flowers of the pomegranate, the elegant myrtle, and the fragrant exhalations of oranges obscured under a dark green foliage, convince the stranger that he is in the garden of Europe.‡ In the valley of Nepaul, the wild apricot, peach, pomegranate, and raspberry, the cultivated orange, fig, citron, quince and apple, and the finest odoured roses, myrtles, lilies, and carnations may well persuade the Anglo-Indian that he is not far from the garden of Asia.

* DECANDOLLE, and so far as memory serves me, by HUMBOLDT.

† Palermo is in lat. 38°, although included in one of these sections of European Climates.

‡ MALTE BRUN'S Geography, vol. iii. p. 53.

The year here with reference to vegetation may be correctly enough divided into five seasons, of which two are the most prominently marked, viz. the winter and rainy season; the former by the complete repose of vegetation and nature, as manifested by the russet hue of the grass, and the bare brown earth of the cultivated land; the latter by the excessive luxuriance and vigor of the vegetable world. Coming between the winter and rains, we have a pleasant spring, and a short summer, and between the cessation of the rains and winter, a bright and brilliant autumn. In a climate free from sudden vicissitudes of temperature during the day, as well as on the change of seasons, and remarkable for its equability, and temperate character, it is not easy to define the separate seasons by dated limits. But the following partitions of the year, have each their distinguishing marks in the vegetable kingdom, as well as to the animal senses. The winter commencing about the 15th November, and continuing till the 1st of March, is marked by heavy morning fogs, an average temperature in the house of about 48°, frequent hoar frost at night, brownness and death of the grass fields, and the total absence of green, (save towards its termination when the wheat gets up), from the arable land. The spring is ushered in on the early days of March, by occasional evening storms from the N. W., followed by showers of rain, or hail, a delightful breeze from the West, which is welcomed into every house by open doors, springs up at noon and blows till sunset. Quiet vernal showers are frequent; willow trees, apple trees and Indian lilacs, put forth their leaves and blossoms; the grass begins to sprout; the wheat fields are clothed in verdant hues; the birds begin to pair and sing, and nature throughout all her works is busy in reanimating her children, which for a while, were permitted to rest from their labours. Summer sets in with the month of May; storms from the N. W. with westerly breezes continue, and occasional showers give a refreshing coolness to the air, now sometimes heated to 80 degrees. The cultivator is employed in sowing rice, and reaping wheat, this short season combining the climate and labours of an English summer and autumn with the cultivator's operations during Octo-

ber and November, in the plains of India. The rains are ushered in as in Bengal by thunder and lightning, and usually commence at the same time as in Tirhoot and Sarun. With the first fall the transplanting of the great rice crop begins, and with their cessation the harvest of the spring sown, or upland rice. The rain falls frequently in torrents as in tropical countries, but often quietly and for days together, the sky being generally cloudy: vegetation of all kinds is now in its utmost vigour, the crops grow with an astonishing rapidity, and the grass requires incessant cropping or eating by cattle to keep it down. Early in September there is a considerable diminution of the temperature of the air; thunder and lightning again commence. The rain falls more suddenly, and at longer intervals; the sky becomes clearer, and less cloudy, and by the 15th of the month, a new season has fairly set in. This season, (the autumn,) is marked by the pleasant and congenial mildness of the temperature to the feelings. A bright day is preceded by morning fogs and succeeded by skies as clear, and mellow as those of Italy. The face of the country is now a variegated map of green and golden yellow, with every intermediate and bright tint from growing, ripening and ripe crops; with the month of September the upland rice harvest commences, nor does the harvest throughout the valley meet with interruption until the end of November.

The seasons as above slightly sketched are five. The winter commencing 15th November; the spring commencing 1st March; the summer, 1st May; the rainy season, 15th June, and the autumn, 15th September. The winter lasts 3½ months; the spring, 2; the summer, 1½; the rains, 3, and the autumn 2 months.

AGRICULTURAL AND HORTICULTURAL CALENDER.

These subjects united under one heading, will render the detail less tedious than the formation of a separate Calender for each. I shall introduce such notices on arboriculture as my scanty notes in that interesting department contain.

In Nepaul the year is divided according to the Hindoo luni-solar system, into 12 lunar months, with an intercalary month added once in about 3 years, for the purpose of squaring time with the reckoning of the solar year. When it is necessary to supply this intercalary month, it is named similarly to the month immediately preceding it, so that every third year contains two months of the same denomination. This circumstance would render a Calender drawn out under the monthly divisions in use here, rather confused to the English reader, and as such accuracy is not really necessary, I shall arrange the proceedings in the fields and gardens with reference to the divisions of the solar year, using our own months, but also inserting the names of the months by Nepalese reckoning to them.*

December, (Aghun and Poos.)

The wheat sowing having commenced at the latter end of November continues the whole of this month, and onwards till the end of January. It is sown broad caste, the sower carrying the seed in a box the size of a ½ peck measure under his left arm. The lands to be sown with mustard seed, and upland rice now receive a preparatory delving, pulverization and arrival. The rice harvest is concluded early this month. The sugar-cane cutting commenced in November, is terminated by the middle of the month, buried in pits and disinterred as required for making goor, (soft sugar), beans and salads sown during the months, hill potatoes, young garlic, and radishes abundant in the bazars, and the gardens yield turnips, carrots, beet root, cauliflower, cabbages, spin-

* The era by which time is reckoned in Nepaul, is that of Vikramajeet called Sumvat or Sumbut. To this era (see Prinsep's table) "the luni-solar system is exclusively adopted. To convert Sumbut into Christan years subtract 57, unless they are less than 58, in which case deduct the amount from 58, and the result will be the date, B. C."

age, celery, and other salads. Oranges grown in the valley of the sweet and bitter varieties, now in full season and of delicious quality, limes and lemons of various kinds and superior flavour most abundant, as well as plantains and pine apples, (the latter getting out of season), from Noakote and other neighbouring vallies.

January, (Poos and Maugh.)

The wheat sowing terminates, and the sowing of the mustard seed commences towards the end of the month. Successive crops of garlic, and radish sown.

The cultivator's time chiefly occupied in fallowing and manuring upland rice grounds. The goor making continues all this month. Peas, beans, and salads sown towards the end of the month. Oranges in great profusion all this month. Inferior pine apples from Noakote still coming in. Limes and lemons, very abundant. Plantains from Noakote still procurable, but becoming scarce.

Potatoes, radishes, garlic, cabbages, knole cole, cauliflower, spinage, beet, carrots, turnips, celery, and salads in prime season; young onions coming in. The peach and plum trees begin to blossom about the end of the month: and the rose plants ought to be raised from the nursery beds and transplanted.

February, (Maugh and Phagoon.)

The cultivators chiefly employed in storing manure near the gohya rice lands, and in delving and pulverizing the lands for that crop, and Indian corn. The mustard seed sowings continue during the first half of the month, and a crop of kerow is also sown. The making of goor continues and is finished this month; a little sugar-cane planted this month. The garden sowings this month are, peas, cabbage seed, cholahi, laul sag, French beans, salads, and other greens. Radishes and garlic in great abundance, also cauliflower, cabbages, turnips and onions; oranges and limes in great plenty; a few plantains and pine apples from the interior still procurable.

March, (Phagoon and Chyt.)

The month is chiefly occupied by the cultivators in preparing their lands for the spring crops. Some Indian corn is sown at the end of the month, and if the season is warmer than usual, the gohya rice sowing is commenced, and some sugar-cane planted. The garden sowings this month are, peas and French beans, cucumbers, melons and a host of other cucurbitaceous plants, potatoes, capsicums of various kinds, radish, lettuce, beans, ramtorai and Indian corn. The vegetables in season are, beans, garlic, lettuce, and spinage; oranges and limes still abundant. Apricots and pears in blossoms.

April, (Chyt and Bysack.)

The gohya, or upland rice, and the Indian corn sowing is the great work of this month; the sugar-cane planting is all finished in April. Cucumbers and melons sown during the month, and in great quantities. The land for these plants is very carefully prepared and finely powdered. The seed is sown in rows, about 2 feet asunder, and about 1 foot apart in each row; a quantity of manure is laid round each seed, and when a stream is near at hand, and the spring showers, (usually frequent during this month), are rare, hand watering is often had recourse to. The plants scarcely ever fail to yield good crops in this valley, especially the different varieties of cucumber, which are eaten in great quantity during the rains by all classes of the people; radishes sown this month grow to an enormous size. The garden sowings are, peas, French beans, lettuce, cabbage and cauliflower seeds in nursery beds; and cucumbers and melons, all of which are ready for the table in August.

Green peas and asparagus on the table all this month; lettuce also in season; strawberries abundant during the last half of the month, as well as artichokes; onions and laul sag in profusion. The apple trees are this month in blossom; apricot and pear trees in fruit; roses in full blow; liliaceous plants of great beauty and variety, wild and cultivated, commence flowering towards the end of the month, as also carnations.

The orange, lime and pumplenose trees are now in full blos-

som, scenting the air with their fragrant perfumes, and that beautiful tree, the bukain or Indian lilac, is loaded with flower, and as yet leafless. The horse chesnut, the walnuts and innumerable shrubs are all this month coming into flower. Oats and wheat in ear, but green.

May, (Bysack and Jeith.)

The upland rice sowing is concluded during the month and the nursery beds for the great crops of transplanted rice are sown. The wheat harvest commences about the middle of the month. In the garden, French beans and salads are alone sown. The vegetables in season are, peas, cucumbers, salads, radishes, laul sag, (Amarantus gangeticus), and artichokes: the fruits are, melons, strawberries, the kaiphul (Fragaria vesca) and wild raspberry. Roses continue in blossom during the first half of the month. The relative climate of the valley of Cashmere, to that of this one, its Himalyan congener and analogue, may be noted by the following simple fact contained in one of JACQUEMONT'S letters from that vale, dated 13th of May, he says, "The lilacs and rose trees are not yet in flower." Here the lilac and rose blossom early in April.

June, (Jeith and Assurh.)

Weeding the gohya rice and Indian corn crops, reaping the wheat crop and preparing the water courses, and margins of the fields for transplanting the rice crop, are the chief occupations of the husbandman, during the first half of this month. The rice plants in the nursery beds, are now (about the 15th,) well up, and the cultivator looks anxiously for the first heavy fall of rain to enable him to commence the great work of the year, the rice transplanting. The transplanting commences generally between the 15th and the 25th of June. In 1835 it commenced about the 20th, heavy rains having previously fallen. Oorid, bhutmas, and several vetch crops are sown this month, some of which ripen in September, some in November. The garden sowings are at a stand still during the month, and the table is but ill supplied with vegetables, laul sag, salad and indifferent cucumbers being alone procurable. Fruits there are none save the wild

raspberry, the kaiphul and burberry. The apricot, (from European stock), in very early seasons comes in about the very end of the month.

July, (Assarh and Sawun.)

The first of this month is employed in the field in transplanting of the rice crops, an operation which it is considered essential to have over before the middle of Sawun, or end of July. Towards the end of the month the garden sowings, interrupted during last month, and most of this, are renewed, but only to the extent of sowing radishes, cabbages and cauliflower seeds in nursery beds, and sundry kinds of greens. Potatoes of good quality are brought into the valley from the neighbouring hills in large quantities towards the end of the month, and the pulwul, (Trichosanthes dioica), a fine flavoured vegetable, is supplied from the valley of Noakote. The vegetables of the valley are capsica of various kinds, lettuce, kidney beans, ramtorai (Hibiscus longifolius), bhueeghan (Solanum hirsutum), cucumber, and about a dozen other varieties of similar plants, such as kearuh, kukuri, kuddu, kunkea, &c. &c. The fruits of July are mangoes from the plains, pears of indifferent quality, plantains, watermelons, mangoes, jack fruit, and rose apples from Noakote. Those of the valley are, plums, apricots, apples of fine flavour from English stock, and quinces of good quality, of Cabul origin, I believe.

August, (Sawun and Bhadoon.)

Weeding the rice crop, and keeping the margins of the terraces perfect, are the chief operations during this month. The gohya rice, the oorid and other vetch crop harvests commence towards the end of the month. In the kitchen garden, this is the busiest time of the year; the seeds of all the table vegetables for consumption in October, November and December, are now sown, and the strawberry, cabbage, celery and cauliflower, transplanted; all the kitchen vegetables perfect their seed here annually, except the red cabbage which is propagated from sprouts. Even this plant has seeded, but cabbages grown from them were without the red colour, being nearly white with a pink

tinge. Potatoes are planted in the valley this month. The vegetables this month are French beans, salads, capsicums, (green and red), cucumbers, fresh Indian corn pods, green ginger, and turmeric roots, laul sag, ramtorai, pumpkins, onions, radishes, garlic, and the small white early turnip. The fruits of the valley are, plumbs of several kinds, apricots, quinces, apples and pears of English stock, and a large hard pear, like the baking pears of England; grapes also, but rather unripe are procurable.

The fruits from Noakote are, mangoes, not good, and generally filled with eggs and larva of small insects, delicious pine apples, plantains of innumerable variety and very fine guavas, custard apples, cherimoya, introduced from the Calcutta Botanical garden, pears similar to those grown in the valley, and very fine limes and lemons.

The wild cherry tree, which flowers in November and ripens its indifferently good fruit in May, casts its leaves this month, remaining bare until December. The toon tree, (Cedrela toona), flowers this month.

September, (Bhadoon and Assin.)

The gohya rice harvest becomes general early this month, and is continued throughout it; as soon as the gohya is reaped, the soil occupied by it is turned up, and instantly sown with radish, mustard, garlic, oorid, or some other of the vetches. The oorid, and other pulse sown this month are reaped in November and December; their grain is considered superior in quality to that of the spring sown crops of this kind, which are reaped in September. Transplanting of cabbages, knole cole and cauliflower; trenching of celery, and sowing second crops of salad, beans, carrots, turnips and radishes, form the chief work of the garden this month. The table vegetables are French beans, lettuces, capsicums, fresh ginger and turmeric, radishes, potatoes and Jerusalem artichokes. The valley fruits are, apples, apricots, and plums. The fruits from Noakote are pine apples, limes, lemons, plantains, guavas, custard apples, watermelons, musk melons, jack fruit and cherimoya.

October, (Assin and Kartik.)

The great harvest of the transplanted rice commences this month, and other crops continues until early in December. This harvest may be considered as the fourth during the season. First of all in May we have the wheat and mustard harvest. In June and July, the early Indian corn harvest, and the ripening of cucumbers, melons, and other green crops. Thirdly, in August and September, the gohya rice, oorid, bhutmas, and other pulses and Indian corn harvest; and fourthly, in October, November, and the early part of December, the great harvest of the flooded rice, murwa, sugar-cane, oorid, bhutmas, ginger, turmeric, phofur, &c. &c. The garden sowings this month are pears, beans, beet, carrots, lettuce, onions, garlic, radishes, potatoes. The growth of the valley comes into season this month;. Jerusalem artichokes, peas, asparagus, small turnips, salads, and greens, are the vegetables for the table.

The fruits of the valley this month consist of figs, apples, pears, limes and pomegranates of an immense size, originally reared from Cabul seed; some of these measure 15 inches in circumference; they are of good flavour, but have a rather bitter taste. There is generally towards the end of this month, a small second crop of English apples. The Noakote fruits are pine apples, plantains, melons, limes, nectarines of inferior flavour, and guavas.

November, (Kartik and Ughun.)

The rice and other harvests, continue throughout this month. As soon as the rice is off the ground, the fields are flooded, and turned up preparatory to the sowing of wheat; mustard seed, (sursoo and turi), are sown during this month, as well as radishes and garlic; sugar-cane cutting, and goor making commence towards the end of the month. Ginger, turmeric, ground nut, and red pepper crops are collected and stored, and in some dry spots, with a Southern exposure. The wheat sowing commences about the very end of the month. In the gardens, peas, beans, salads, turnips, and carrots ought to be sown. For the table there is an abundant supply of fine vegetables, such as cauliflower,

cabbage, knole cole, beet root, salad, celery, carrots, turnips and spinage. A second crop of new potatoes from the hills comes into play this month. They are almost exclusively of the red variety, less mealy, and more waxy than those grown about Patna, but very good. The potatoe cultivation in these hills is carelessly performed. Apples, pears and a few figs are the only valley fruits, except indifferent pumplenoses (shaddock), and not good loquats. The oranges however begin to ripen towards the end of the month, and limes are abundant. Limes, plantains, guavas, and pine apples still procurable from Noakote, but going out. The vines now are of inferior quality; the greatest ornament of the valley at this season is the wild cherry tree, which throws out its blossoms, as all other plants are becoming clothed in winter colours. There are two varieties of it; the one has a pink flower, the other a white one; the former is a less tall tree than the other, having generally one straight and bare stem or trunk about six feet high, whence the branches go off, and become very bushy, the entire height of the tree being about 15 feet. The white blossomed variety grows to the height of about 25 feet, and is less bushy. The fruit of both, alike hard and bitter, is ready in May, and fit for making ratafia. The natives of the country however eat and like it.

Concluding Remarks.

It occurs to me on coming so near the termination of these notes, that three subjects of much interest have been overlooked, and that however small the amount of information in my memoranda concerning them, it may still be worth transcribing. The first of these, viz. the diseases, or destructive agencies to which crops are subject here, will not occupy many lines.

The cultivators are familiar with what I have frequently observed here, and with what our English wheat crops are often injured by. The common term for the blackening of wheat ears is *smut*, regarded by the vulgar in Europe as well as here, as a disease. But a correct and rational explanation has been furnished by the Entomologists.* The insect known in England,

* Messrs. Kirby and Masham.

whose destructive operations on wheat are precisely analogous to what is observed here, is a small orange coloured midge, (*Cradamya tritica*), which deposits its eggs in the floret of the wheat, towards the end of June and throughout July.* The consequence of this is, that the anthers of the florets on which the larva feed when produced from the egg, are totally destroyed, and no seed is formed in the ear, which becomes black and powdered. This disease is not very general in Nepaul, but I have annually observed it to exist in the wheat crops, and although I have not seen the insect alluded to, I have no doubt that it is the cause of this effect. The wheat flowers in April, after which the smut appears. The depositing of its eggs in June and July in England, will not invalidate the idea of its being the same animal which lays its eggs here in April, as nature adapts the breeding seasons of all animals to the occurrence of the necessary favourable circumstances. The Newars attribute the smut to the state of the wind, or of the atmosphere, in general ungenial to the young wheat ear; but are disposed to believe that there is more of it in wet, than in dry spring seasons. Wheat alone of all the white crops is subject to smut. The next disease of crops prevalent here is, languishing and whitening of the young rice plants, when only a few inches above ground ; this is attributed to the attacks of a large grub, called kiongki or root worm, of a black or blue colour, generally the thickness of the four finger, sometimes as thick as the thumb, and about two inches long. It is supposed by the natives to be produced, and to thrive best in rotten manure, and to devour the seed and young radicals of the plant. The kiongki is most destructive to the gohya or upland rice, attacking it soon after being sown, and continuing its ravages until about the middle of May, after which it ceases. The people do not know of what flying insect this grub is the larva, nor have they any remedy against its attacks except removing it from the fields when they see it. The third disease of white crops is a premature whitening of the ears of rice, (both kinds), and the failure of the grain in them. This is attribut-

* See Natural History of Insects in LARDNER's Cyclopædia.

ed by the Newars to the attacks of a small grub the size of the common white maggot, the body of which is white, the head black and hard; it is called the *sheo-ki*, the marrow or pith worm.* The sheo-ki is supposed to eat the roots of the rice plants, but its prey more especially is said to be the stalk and juices of the plant; for obtaining the latter of which it cuts the plants at the joints, after which the ear whitens without filling. The natives attribute the drying up of the ear and plant, to the drinking of its milk, (sap), by the grub, which prevents the due formation of a full sized grain. The visitation of locust flights is the only remaining evil to be contended with by the cultivators from the insect world. There have been three annual but trivial visitations of these destructive animals within the last five years. They arrived on these occasions in May, and remained four or five days each time. Whence they came or whither they went, could not be ascertained. The natives here say they come from the plains and from the West. The Newars indemnify their losses by the locusts by collecting them in large quantities and eating them. They remove the wings and either fry or make curry of them, and consider them very good. I have seen them dressed, and tasted the dish, but cannot praise its taste or flavour. The fruit trees of the valley gardens, are the prey of a most formidable and destructive species of grub. It is about an inch and a half long, sometimes bluish coloured, sometimes yellow; it makes its attacks on the roots as well as the stems of the apple, pear, plum, and apricot trees, drilling a hole like a gimlet right into their substance, where apparently revelling on their sap, and completes their ruin as fruit bearers, and often destroys their lives. When this animal makes its entrance into the stem from without and above ground, it leaves a round hole fit to receive a common pea, and sends out behind it small grains the colour of the tree wood, which on handling crumble into the finest powder.

The appearance of these grains and their dry sapless structure

* Ki in Newari is the generic term for worm or grub. Kiong is root, and sheo the marrow or brain of animals, and pith of trees and vegetables.

induce the belief that they have been passed from the animal per anum.* The moisture of the soil, and warmth of the air during the rains conduce greatly to a profusion of insect life in the valley, and at that season the air actually teems with thousands of these busy creatures, none of which, save those above enumerated, are accused of being at all injurious to the cultivated productions of the country.

The next circumstance to be glanced at is an interesting one. The people employed in the cultivation of the valley are composed of two distinct races of men, which are divided into several totally different tribes. The Newars, who form by far the greater part of the agricultural classes, *(perhaps in the proportion of 6 or 8 to 1)*, personify in features, language to a considerable extent, in religion, and in usages, the Chinese or Thibetian race. The Brahmuns and the Khas of the Parbutteah division of the population represent the other or Indian race. The Mayars, Gurungs or Murmis, who form the remaining tribes, do not so readily admit of correct classification as these races.† The two

* This grub is an inch and $\frac{1}{8}$th long, $\frac{1}{6}$th inch in diameter at the head, some thing in vent, as its head is the largest part and the body tapers to the tail. The head is a brownish red colour, and is formed of a very hard shell-like substance, on the anterior aspect of which there are a few delicate white hairs. The upper part of the mouth as well as both sides are formed of this shelly hard substance, the lower part of it, of a white soft substance like the body of the animal. The body is formed of 12 distinct rings of an uniform yellowish white colour. Along each side of the animal close to its belly is a row of brownish coloured spots, one on each ring. The animal has altogether 8 pairs of feet, distributed as follows: 3 pair sharp pointed directed towards and attached to the three first rings from the head; 4 pair shorter, close together, pointing to the ground, and to the 6th, 7th, 8th, and 9th rings; and lastly, 1 pair similar to the last or abdominal ones, at the vent attached to the last or 12th ring. Its body when but open, discharges a thin clear and slightly viscid fluid, sap doubtless.

† The whole mass of the population is readily referred by physiognomy and language to the Northern or Mongoul race, but is divisible by language dialectically and by palpable varieties of the same caste of formed features; these divisions are for the whole kingdom, Limbu. Lapchu, Kiranti, Kacharia, Murmi, Newar, Jaria, Gurung, Mayar, Khas. The last is a mongrel race derived from an indigenous tribe so termed and from low land emigrants, chiefly of the sacred order, who have essentially modified the Tataric attributes of the Khas. The other tribes are still in speech and aspect Northmen; and most closely affiliated.—B. H. Hodgson.

former profess Hindooism and practice its ordinances in a very convenient and easily accomplished fashion. While the last, the Murmis, profess and practice the Boodhist religion and have a language like the Newars, indubitably derived from the trans-Himalayan stocks.

The Newars cultivate almost the whole of the land on the flats of both levels; they use the digging hoe exclusively for turning up the soil and live in towns and villages of tile and brick. The brahmuns and Parbutteahs are generally, if including Mayars and Gurungs, engaged in cultivating the soil. They occupy the confines of the valley, the subordinate valley which recedes from it, and the lands fit for yielding crops along the declivities of the mountain bases. These people use the plough partially, but not generally, and live in insulated cottages built of stone, or unburnt bricks, and generally thatched, rarely tiled.

The Murmis (indifferently distinguished by this name or by that of Bhooteas) cultivate generally the hill soils facing the valley, rarely holding lands on the flooded flats, and often extending their little patches of cultivated land and their mud and stone built and grass thatched cottages, to the very tops of the boundary mountains. The Murmis use the plough, but not often; their locations being generally much too steep for it. This is but a general indication of the localities of the different tribes employed in agriculture; individuals of these races and tribes, are to be met with in all parts of the valley and its confines. The Mewar however very rarely indeed leaves a village to fix himself on the mountain tops or sides, nor will the Murmi, if he can help it, live on the flat flooded parts of the valley. The brahmun's ubiquity is most conspicuous; he is to be found in the flatest parts, on the confines, and on the tops of the surrounding mountains; but as his numerous privileges, and holy character often enable him to be exempted from the exclusive drudgery of the field, his residence on the flooded flats arises generally from his desire of being near the larger towns and temples, whence he can visit the charity bestowing, and pious portions of the richer community, or exercise his vocation as a teacher of slokes or pronouncer of munters among people little

able, or anxious as his rural neighbours generally are, to question his competency as an instructor and guide.

The last subject alluded to at the commencement of these remarks, I can at present but barely notice. The wages of labour, agricultural and of other kinds, ought to have been noticed in the early part of this paper. Materials are not within my reach to admit of drawing comparisons between the rates here, and in countries to the North and South of us from which something satisfactory might be concluded regarding the relative state of these countries, and their people. I shall therefore merely place side by side, the rates of wages of labour, in a few trades and occupations in the valley of Nepaul; the town of Lhassa in Thibet, and in Tirhoot, within our own provinces.

NOTES ON SOME OF THE AGRICULTURAL AND OTHER IMPLEMENTS USED BY THE INHABITANTS OF THE VALLEY OF NEPAUL.

No. 1. The sugar-cane mill or press, called *toosa* by the Newars, and *kouloo* by the Parbutteahs. It is of very rude and simple construction, but efficient enough for its purpose among a people who are as yet content to go without the aid of horses and bullocks in the labours of husbandry and mercantile transport. The sugar-cane grown in the valley is, for the most part, a small slender species of this plant, which ripens in the months of December and January, when its juice is expressed and evaporated to the semi-crystallised form of *goor*, being rarely further treated by the Newars than to the attainment of this course of sacharine matter. All the *chenee*, (soft sugar), and *misree*, (candy sugar), used in Nepaul and the neighbouring portions of Thibet, is imported from the plains of Hindoosthan.

The toosa stands in the open air, either at the house of the cane grower or more commonly in the field, where a small shed is erected for covering the evaporating boiler, and storing the jars of goor. It is formed as follows: Two rough and strong posts, 2½ feet apart, of any common wood are sunk in the earth to such depth, as will secure their fixedness under the heavy strain of the squeezing lever. These posts, which stand about six feet above the surface, are connected by two horizontal beams, of considerable strength, the lower one being about 2 feet from the ground. In front of these upright and horizontal beams, and at about 3 feet distance, two other posts of 3 feet above the surface are sunk; the space between them being occupied by the shorter limb of the squeezing lever which plays on a wooden axle, passing through the shorter limb, and the smaller posts. On the top of the smaller posts, and on the lower one of the beams which connect the larger posts, is laid a thick plank of heavy wood 2½ feet broad, and about 6 feet long; its surface being grooved transversely at one end, and having a channel cut along the sides, for carrying off the expressed juice towards the opposite

termination of it, which is perforated and lies immediately over an *earthen* vessel sunk in the ground for the collection of the fluid. Over the grooved end of the lower plank, and under the upper beam which connects the larger posts, a thick plank about 2 feet long is laid, which forms in fact the upper *mill stone*. The sugar-cane being cut into pieces of a foot long, is placed between these thick planks, the upper one being pulled down by the depression of the longer limb of the lever. The upper plank and the shorter limb of the lever are connected by a strong rope or strap of leather. The lever is precisely the same as that used in Behar for emptying wells without the addition of a weight at the extremity of the longer limb and rope for depressing it. The Newar sugar-cane squeezer is content to climb up to the elevated limb, and by the weight of his body in the air and the strength of his arms when he reaches the ground, depress it.

The sugar-cane juice is evaporated in common earthen vessels, until it assumes the proper thickness, when with scarce any purification it is stored up for use. The dry juiceless cane is used as fuel by the poorer natives.

No. 2. *Chikowsa*, the oil press of the Newars. This machine is even more rude than the former, being actually little more than two logs of wood, so placed as to be capable of being separated for a small space at one end, and again approximated without any mechanical aid, save the very poorest. The sarmi, (oil maker), builds a house for his press, and like the Scottish miller, has frequently an allotted district, from which grist comes to his mill exclusively. He sometimes purchases oil seeds, and becomes a large dealer in the article; but, most commonly, he depends for his sustenance on the payment by the small farmers of a portion of the oil from that made at his mill, which he converts into money. The machine is made and worked as follows: two strong wooden posts of which about 3 feet are above the surface, are driven 3 feet asunder into the earthen floor of the press house, and connected by a horizontal beam, under which and over a moveable log lying on the ground, one end of the logs forming the *press proper*, are placed. The logs, each about 16

feet long and 18 inches in breadth and depth, are laid parallel to one another, secured at one extremity as above mentioned, the opposite one from the operator being free and admitting of being separated to the extent of 8 or 10 inches for the introduction of the oil-furnishing seeds. The apparatus for forcibly bringing in contact the logs separated for the introduction of the grain consists of, 1st. a stone pillar sunk in the ground, against which one of the logs rests; 2nd. a strong rope encircling the stone pillar and passed underneath, and over both logs through which the end of a long wooden lever is passed, by the depression of which the logs are approximated; 3rd. a rude stair, on which the oil pressers ascend to grasp the end of the lever, and from which they depress it, until the ground comes within reach of their footing; and 4th. a wooden peg passed through the lower part of the stair, for the purpose of holding *down* the depressed lever, until the oil ceases to drop from the expressed seeds. The seeds, (mustard is the chief), having previously been pounded in a large wooden mortar, and toasted on a large stone kept hot by a subincumbent fire, both being in the same house with the oil press, are put, (to the extent of 8 or 10 pounds), into a bamboo wicker basket, which is introduced between the large horizontal logs. This being accomplished, the operators (two or three in number) ascend the rustic stair case, and seizing hold of the erected extremity of the lever, hang by, and pull it by turns, until their united efforts succeed in depressing it. When a portion of oil is obtained, an earthen vessel lying on the ground receives the oil as furnished. The Newars know not the superiority of cold drawn over drawn oil, or at all events do not manufacture the former. The oil seeds are generally three times pounded and toasted, and as often put into the press; when thoroughly exsiccated, they are carried home and given, (as in Europe), to cattle as well as to poultry. The Newar women use the oil cake or oil grains in washing their hair in the same way as the females of Hindoosthan employ the *oulah*.

No. 3. The water mill, *pau chúki*, of the Northern Doab and Western hills, *kau* of the Newars is so well described in the 19th number of the Journal of the Asiatic Society as used in the

Doab, that I shall only notice the slight points in which the Nepaul one differs from the other. Of the Doab one it is said, "A horizontal water wheel, with floats placed obliquely so as to receive a stream of water from a shoot or funnel, the said float boards being fixed in a verticle axle passing through the lower millstone and held to the upper one by a short iron bar at right angles, causing it to revolve with the water wheel, *the axle itself having a pivot working on a piece of the hardest stone that can be procured from the shingle near at hand.* This, with a thatched roof over it, and the expence and trouble of digging a cut, so as to take advantage of a fall of water, are the only articles required in this very simple mill." This description is correct for the Nepaul mill, with the exception of the contrivance for a pivot on which the axle turns, and that for a cup for the reception of the said pivot. Instead of a rounded *pebble* being sunk into the lower end of the arbor, and a larger stone being embedded in the horizontal beam or transom, on which the pivot revolves, we have in the Nepaul one, an *iron* pivot, driven into the nave of the water wheel, and a square piece of the same metal sunk into the transom, and its upper surface hollowed out for the pivot to revolve in. In all essential respects, they are the same, and alike rude in construction. On this point, I am enabled to speak from personal observation, as I have had many opportunities of examining the water mills of the Dehra Dhoon and Western hills, as well as those of the valley of Nepal.

The water mill does not supersede in Nepaul the use of the common hand mill; as the latter is to be found in almost every cultivator's house, and exactly similar to the one used in the plains of India, viz. nothing more than a couple of circular stones, about 18 inches in diameter, the superior one resting on a pivot fixed in the lower one, and having a peg of wood driven into it, by means of which it is made to revolve on the other as it lies on the ground. Mr. ELPHINSTONE found the water mill with a horizontal water wheel immediately below the millstone in general use beyond the Indus, and says, that " it is used all over Affghanistan, Persia, and Toorkistan," throughout the hills, from the Sutlege to the Mitchee, or Eastern limits of

Nepaul, its use is general, and has been so in all probability for a long period of time; more recently this kind of water mill has been introduced into our territories in the Northern Doab, which lie along the upper Jumna; and so great is its simplicity, and so well is it adapted to the appliances of the most ignorant natives, "that it has been adopted generally in all the canals in the Delhi district, as well as in those of the Doab."*

A similar mill is said to be used in some of the most Northern of the Scottish Islands as well as in Provence and Dauphiny.

The power of the Nepaul mill is not by any means great, nor is there much inducement for the improving of it beyond its present state. Wheat in Nepaul holds a very low place among the farinacea in comparison with rice, in consequence of the better adoption of the soil for the latter grain; and so small is the consumption of *atta*, (meal), that the miller cannot depend on his craft as an only means of subsistence.† As an average of the power of these mills, the produce of one after 24 hour's grinding ranges from 7 to 10 muris of meal, (from 14 to about 20 maunds,) the latter quantity being considered the maximum produce of the best.

The earnings are for the most part in kind, and the rate of payment varies according to the supply of water at the time of grinding, as well as to the quantity of grain brought by an individual. The highest rate for grinding is an 8th of the produce; the average $\frac{1}{10}$th; and the lowest $\frac{1}{16}$th; this being for grinding alone, as the proprietor of the grain transports it to and from the mill.

The payment in kind for grinding corn is, I believe, universal in the hills. It is customary in the Delhi territory of India, and I can vouch for its being the invariable mode throughout a large portion of the highlands of Scotland. The rate of remuneration in the latter country was, in 1827, $\frac{1}{16}$th for grinding oaten meal; $\frac{1}{10}$th for grinding barley meal, and $\frac{1}{20}$th for grinding malt, which had paid duty; a good deal more for the smuggled article

* See Journal of the Asiatic Society, No. 19.

† Murwa, kodu, Indian corn, and a little rice is ground by these mills, besides wheat. The ground rice is used for making sweetmeats.

as an indemnification to the miller for the risk run in admitting the contraband to his premises.

No. 4. *Koo*, (Newari), kodalee of the Parbutteahs; the hoe or spade with which the Newars turn up the soil of their fields. They do not use the plough, and compared with the Indian one, (which is used by the Parbutteahs), this spade is a much more efficient instrument. Its cut is from 4 to 6 inches deep. The Newars use it with dexterity, and delve a field in a surprisingly short space of time, turning the earth up in ridges or narrow beds. The koo resembles our adze more than a spade, but differs from the former in having its bundle projecting from the off side of the neck of the instrument. The delver holds the handle in both hands, and stooping forward, raises the spade at each cut above his head. By bringing it down strongly and steadily, and cutting the sod rather slantingly he can make a furrow in well moistened ground of 9 inches deep. The ground for both crops of rice and of wheat has two or three delvings. So soon as one crop is off the ground, the Newar turns up his field for another, thus gaining all the advantage from the decaying stubble which early ploughing can give.* This immediate turning up of the soil, is a matter on which the Newars lay much stress, and consequently it is very common to see the women and children of the family cutting down wheat and rice at one end of a field, while the males are delving it from the other. The koo costs about 1 current rupee.

No. 5. *Kurmughau*, (Newari), the wooden crutch-like instrument used by the Newars for breaking down the clods and preparing the soil for receiving seed. With this they reduce the earth to the finest powder; it is all they have for serving the purpose of iron rakes and harrows; nor is it inferior to them in the hands of the very hard working and skilful husbandmen who use it.

No. 6. *Koochi mughau*, (Newari), the instrument used for co-

* Sir HUMPHREY DAVY proved chemically the advantagés of using vegetable manures *fresh*, and the practice is now general in England. See his Lectures on Agricultural Chemistry.

vering over sown wheat and gohya or upland rice, is a block with an upright shaft used like a pavier's block. The gohya variety of rice is suited to dryish lands, is not transplanted, but laid down in seed most carefully and laboriously with the fingers. When sown thus, the ground is beaten down gently with the *koochi mughau.*

No. 7. *Chassu mughau,* (Newari), a thin-edged wooden shovel used for smoothing the flooded beds, in which the seed of the *malsi* and *toli* varieties of rice are sown for the purpose of furnishing transplants or seedlings. It is also used in the suburban fields, devoted generally by the Newars to the raising of culinary vegetables, pepper (red), ginger, &c. &c., where it is necessary to prepare the soil carefully and finely.

No. 8. *Koo keetcha,* (Newari), a small broad pointed hoe, used by the Newars for weeding the flooded rice.

No. 9. *Chong kooki,* (Newari), a sharp pointed hoe, used in weeding the gohya or dry land rice, oorid, (a vetch), and other drill crops.

N. B. Nos. 8 and 9 are iron instruments with wooden handles.

No. 10. *Kooe,* (Newari), a clumsy wooden shovel for spreading grain to the sun and collecting it in heaps after it removal from the straw. The Newars do not use the flail in threshing their corn. There are two modes in use; in separating the malsi rice from its straw, nothing is required beyond the shaking of the sheaf and a few knocks on the ground in consequence of the preparatory treatment undergone by this crop, or a great part of it. After being cut down, it is stacked on the field, and left to become heated and to ferment for 6 or 8 days, after which the stacks are pulled to pieces, and the grain separated from the straw winnowed by being shaken to the wind from a shallow platter made of mat and bamboo and dried in the sun. The grain thus treated is called *hukwa,* and is much liked. The other mode and the one employed at the wheat vetch and gohya rice harvest, is simply beating out the grain with a long stick as it lies on the ground. All the grain in the valley is separated from the straw on the field and carried home after being win-

nowed in bags and baskets, carried banghy ways or suspended from a stick, borne on the shoulders. The crops are reaped with the sickle, which instrument is similar to the European scythe sickle, but smaller. The Parbutteahs, in common with the Newars, use this instrument, and rarely pull up the crops by the root, as is the practice of the plains.

No. 11. *Lusi ooh*, (Newari), the large wooden pestle and mortar universally used in India, for husking grain. A block of hard wood, 3 feet long, and 15 or 18 inches in diameter, shaped rudely like an hour glass and hollowed from one end down to the middle, is all that is required to form the mortar. The pestle is about four feet long, rounded for about a foot in the middle, and squared on three sides at both ends. It is used by one or two persons, the centre portion held in the hand, and either end employed for beating the contents of the mortar. The machine is employed principally in Nepaul for making *choora*, or the bruised rice, so much eaten in all rice countries of India when the people are travelling, or from other causes unable to procure time or fuel for regular cooking. The *choora* is made thus: the rice in husk, (dhan), being steeped in water for a day and night, is toasted for a short time on a stone or large tile heated for the purpose; when thus parboiled, and while still soft, it is thrown into the wooden mortar and bruised into their flat flakes, in which state, having previously been separated from the husks and dried, it is sold in the shops and eaten by the people. A native of Nepaul, or of Bengal and Behar will be satisfied to live on this substance alone for many days together; a small quantity of sukur, (unpurified partially crystallized sugar), added, gives it a most grateful relish to the rarely stimulated palates of these poor and primitive people.

No. 12. *Kooti*, (Newari), the machine for converting the dhan into eatable rice by husking; it is the same as that for making soorki from bricks.

No. 13. *Chau kummoo*, (Newari), is the banghy used in all field work, and consists merely of two small wicker baskets suspended from either end of a piece of wood or bamboo, 4 feet long, which the carrier bears on his shoulders.

N. B. Exact models in wood of the above noted implements were deposited in the Museum of the Asiatic Society of Bengal in January, 1836.

(Signed) A. Campbell, M. D.
Offg. Asst. to the Resident.

Nepaul Residency, July 21*st*, 1836.

Notes on the state of the arts of cotton spinning, weaving, printing, and dyeing in Nepaul, by Dr. Campbell, attached to the Residency.

It may safely be asserted, that the arts generally in Nepaul have not hitherto arrived at any degree of advancement beyond that attained in the plains of India. In regard to those which have attained to considerable perfection below, Nepaul is extremely backward in the progress made by her people; nor do I know of any in which the Nepalese can be said to excel their Hindoo brethren of India except the useful one of agriculture, to which may be added perhaps brick and tile making, and, in more recent days, the manufacture of flint lock fire arms. In the arts of weaving it is universally admitted, that neither the Egyptians of the olden, nor the nations of Europe in the modern time, have equalled, or do excel the Hindoos of Dacca and Benares, while this art in Nepaul is still at the very lowest possible grade of advancement. It is matter of curiosity as well as of astonishment, that although the Newars claim, and not improbably hold, a title to considerable antiquity as a united people,* and have made great advances in husbandry, some progress in literature and architecture, they have not got up to this day, beyond the threshold of civilization in that art which among the rudest nations has been found in a state of much efficiency.†

* See Mr. Hodgson's Legends of the origin of this tribe in the Asiatic Journal.

† The Mexicans at the time of the conquest of their country by the Spaniards had manufactures of cotton cloth in considerable perfection. " Of cotton they made large webs, and as delicate and fine as those of Holland."

Some one of the Roman philosophers, I have read, gave credit to SEMIRAMIS for the invention of weaving cotton, and MINERVA herself was, I believe, an enthusiast and proficient in the labour of the loom. Our Nepalese queens of the present day are too proud of their Rajpoot or "moon-born lineage,"* to indulge in the practice of the useful arts. And the goddesses, although abundant as the grains of sand on the sea shore, are now but images of the olden personifications, consequently the weaving art has not descended to the modern representatives of the above named ladies, but still cleaving to the sex as a pastime or profession, we find it confined solely to the women among the Newars. The men toil at other labours, but they weave not, "neither do they spin."

Weaving is scarcely a trade in the valley of Nepaul; for all the Newar women of the poorer classes, (and there are scarcely any others now,) weave the cotton cloths required for the consumption of themselves and families.

These fabrics of domestic manufacture are all of cotton, and of the coarsest and most inelegant description. The cotton is grown in abundance throughout the hottest vallies of the Nepalese hills, and in the Yarai† skirting their plainward face. It is brought on men's shoulders,‡ as picked with the seeds in it to the different towns of the valley where it is exchanged to shopkeepers, for money or other produce, as the case may be; and thus each family, as its means will admit, purchases, from time to time, so many pounds of the raw material as suffices for the employment at the cleaning machine and spinning wheel of the mother and her daughters. The cotton is separated from

* Chandra Vansa.

† Called YEAU by the Newars.

‡ Man is the only animal of burden employed in the valley of Nepaul, as well as the interior of her hills; a circumstance of itself strongly pointing out how short a way the inhabitants have advanced beyond sheer barbarism. The uneven surface of their country is scarcely sufficient to save them from this imputation. The rulers of the land drive English carriages, while the transport of every article in their dominions is made on the backs of men and women; a good specimen of eastern pomp, associated with its common accompaniment, hard-worked poverty.

the seeds by the women, either with the fingers, or by the help of a most primitive contrivance of the following description, and called *reko.* Two rollers of wood, the thickness of a walking-stick, and close together, are placed in an upright frame, and made to revolve on one another by means of a handle attached, (through one side of the frame), to the lower of them. The operator, sitting on the ground, places the frame between her feet, steadying it with her toes, and applies small portions of cotton to the spaces between the rollers with her left hand, while she plies the revolving handle with the right; in this manner the other is drawn between the rollers, the seeds being too large for the interspace, are separated and left behind.

The spinning is equally primitive; but its mode is not easily described. The machine* is small and easily portable, even by a child of six years old; it is not raised from the ground by means of legs, as is the domestic one of the Scottish Highlanders and Northern Irish, (the ones I am best acquainted with;) nor is the wheel set in motion by the pressure of the foot on a board connected by a thong of leather, with a lever or cramp fixed to its axle, as is common in turning grindstone or turning lathe wheels; but the spinner, as in the cotton-cleaning process, sits on the ground, with one hand turning the wheel by means of the handle, and with the other drawing out the cotton into thread.

An iron rod is attached by means of a string to the wheel and revolves in company with it, on which the thread as spun is collected; and in this manner, women and girls of all ages employ themselves, when not assisting at sowing and reaping either in front of their dwellings in the towns, or at the road side, as may best suit their convenience.† The spinning wheel may be best described by saying, that it is but the ancient distaff improved by the addition of a wheel for keeping it in motion; for

* Called YEAU by the Newars.

† The universality of the spinning wheel may be readily credited on the announcement of a custom which enjoins every Newar parent to present his newly married daughter with a Yeau and Reko in addition to her dowry.

the sharp pointed iron rod, to the extremity of which the cotton is applied, and by which it is spun into thread, is precisel t.. spike of the distaff, and, like its prototype, serves the .. purpose of a bobbin on which the thread is accumulated as sp The spinner turns the wheel from left to right while form.. g the thread, and to allow the portion spun to be accumulated on the iron rod, gives the wheel a small turn in the opposite direction, at the same time lowering her left hand so as to permit the winding up of the thread. This necessary interruption in the spinning process is a great drawback on the time of the spinner, and renders the distaff wheel very inferior when compared to the common one of Europe. When tending cattle, or watching their ripe crops, the females generally wile away the time, and assist in replenishing the family wardrobe, by spinning o. weaving in the open air.

Having thus imperfectly spun the yarn, we proceed natu... to the warping and weaving of it, both of which processes are performed exclusively by the women with the very simplest and rudest machinery, equalled by the coarsest and most ungainly produce. The ordinary breadth of Nepaul cot on cloths is about half a yard, and rarely exceeds tw. feet. The average length of the web is from 6 to 12 and 14 yards, and the texture of the finest is not superior to the *dosuti* cloth of Hindoosthan, used for house canopies, (chhats), and floor cloths. When a woman has spun a sufficient quantity of thread for the warp of a web, she winds it off the iron rods, on which it has been spun into, or on large bobbins about 9 inches long, and fit to hold three or four pounds of thread.

With these large bobbins, and a few reeds, about three feet long, she repairs to the nearest grassy spot in her village, or to the side of the causeway if unpaved, and there, sticking the reeds in the ground, (a few feet asunder), to the length of her purposed web, she has prepared the only warping frame known throughout these regions.

Tying the thread to the reed on her extreme right, she moves rapidly up and down the line, passing the thread, (as it comes off the bobbin, revolving on a shaft passed through its axle and held

her right hand,) on alternate sides of each reed, until the "warp is laid."

The dexterity acquired by the women in warping, is considerable, and the quickness with which they entwine the thread with the warping reeds is remarkable, and it is apparently executed with little trouble. I have often seen those women moving up and down, and laying the warp regularly on the frame at a fast walk, and all the while talking and laughing with the persons present, and assisting them in the performance of their task.

Having "laid the warp," the reeds, (or rods of wood, as the case may be), are pulled out of the ground, and the warp, frame and all, is rolled up and carried home. All the cloths made in the valley are of uncoloured thread, which renders the warping a much easier affair than when striped webs are to be laid down.

When leisure offers for weaving the web, the women on a sun-shining day spread out the warp, (the warping sticks still in it), and apply with a brush made of a suitable kind of grass the paste necessary for smoothing the thread preparatory to putting the web on the loom.

The mode of weaving does not essentially differ from that practised in the uncivilized portions of our own country with which I am acquainted. The weaver, sitting on a bench with the loom in front of her, plies the shuttle alternately with either hand, pulling forward the swinging apparatus for laying the woof thread close to its predecessor, and plies the treddles with her feet.*

The weaving is carried on under a shed within a small verandah, or in the house; and as the roofs are generally low, the treddles are made to play in a hollow dug in the earthen floor under the loom. The loom is made of the commonest materials, and very clumsily put together, and is altogether of a piece

* This portion of the loom is extremely rude and primitive; instead of foot boards moving on a fixed point to be depressed alternately so as to make one layer of the warp threads cross the other, and thus incorporate the woof with it, we find two small buttons suspended from the lower margin of the netting, which the weaver seizes between her great and first toe, alternately depressing each foot as the woof thread is delivered by the shuttle.

with the poor state of the weaving art. Lest it should be thought that it is intended to connect the wretched produce of the Nepaul looms, with the rudeness of the machinery as inevitable cause and effect, I may mention that the Nepaul loom and the arrangements of the weaver, are superior in some respects to those of the unrivalled manufactures of the Dacca muslin. Mill's account of the Hindoo loom corroborates this; he says, "It consists of little else than a few sticks or pieces of wood, nearly in the state in which nature produced them, connected together by the rudest contrivance. There is not so much as an expedient for rolling up the warp. The weaver is therefore obliged to work in the open air, as his house could not contain him and his web at full length; and every return of inclement weather interrupts him." The Nepaul weaver rolls up the warp on its original frame, and ties it to a peg driven in the ground close to her feet, while a cross beam in front of her receives the web as it is woven.*

The Tibet woollen cloths are of infinitely superior workmanship to the cotton ones of Nepaul, and indeed some of them are of very fine make and material, although deficient in widths. It is therefore evident that in the earliest of the arts, one which must have been practised by all human societies as soon as leaves and skins were deemed unfitting clothing, the Nepalese have been left far behind by the Hindoos of India on the one hand, and by the Tartars of Bhote on the other.

Dyeing and printing come naturally enough to notice after spinning and weaving; and the advancement made in these arts has kept an even pace with that in the former. As dyesters, the Newars are miserable artists; they cannot at this day dye a decent blue, although furnished with indigo for the purpose.

A dirty red, (from madder), and light fading green, are the colours most commonly dyed by them; but they are not fast and durable, nor elegant when fresh. The only tolerably good dye-

* The different parts of the loom are not connected so as to form one complete machine. For instance, the swinging beam and netting are generally suspended from the roof of the house.

In the commonest Europe loom, the bench on which the weaver sits, the beam on which the web is received, as well as that on which the warp is rolled, together with the swinging beam and netting, are all joined together.

ing done in Nepaul is by some *Cashmiris* and people from the plains.

The coarse cloths of the country are printed in imitation of the chintzes of India and Europe, and are much worn by all classes of females, who cannot afford to purchase better stuffs; but the imitations are very badly executed and the colours not durable. The best Nepalese chintz is printed and dyed at Bhatgaon, in the valley, and in the hills east of the valley, at a place called Dunkutuah. In the small valley of Punouti too, about 24 miles east of Cathmandu, this trade is carried to some extent, and with nearly similar success.

A piece of best Parbutteah chintz, 5½ yards long, sufficient to make an entire dress for a woman, costs at Cathmandu, one Nepalese rupee and a half.*

The subjoined list of the cotton piece goods manufactured in the valley and neighbouring hills, of which specimens are now presented, may not be useless to the public, while it will tend in some degree to give practical illustrations to the above remarks.

As a mode of attempting to estimate the real value of these products, and to assist in throwing light on the condition of the people who make and use them, the value of money in regard to the staff of life may be conveniently recorded,† especially as in Nepaul as well as India the craftsman does not, generally speaking, earn any thing in addition to the common wages of agricultural labour, or in other words little more than suffices to fill his belly, and that of his wife and children, with plain rice and a few

* A Nepalese rupee is equivalent to 1 rupee and ½ anna of Company's currency.

† A full grown labouring man requires for a day's good food, 1½ mannas of rice, and his wife (say on an average) 1½ mannas more, or in all 3 mannas. The present price (November, 1835,) is 26 mannas, or nearly nine days food per current rupee; to this add salt and other condiments worth one rupee more, and it will be seen that the wages of labour such as a man can live on in tolerable comfort, must be about four current rupees per month, and this without any allowance for clothing, house, or luxuries.

The lowest class of labourers and artizans in some parts of the valley, and throughout a great portion of the hills cannot come at rice as their ordinary food, but must be content with the coarser grains, such as murwi, bajra, kodu and Indian corn. Two current rupees per month suffice for their subsistence and is about the price of their labour.

spices, and to buy the raw cotton for the manufacture of his and their coarse clothing. Models of the spinning wheel and cotton cleaning machine accompany the specimens of cloth.

*List of the principal Cotton Piece Goods manufactured in Nepaul proper and throughout the hills; to which is added a notice of the Bhungra or Canvas made from the inner bark of trees and the few coarse woollens of the neighbouring hills.**

1. *Changa.*—Manufactured in almost every Newar's house throughout the valley, and generally in the hills. It is coarse, hard, and thin in texture; it is for the most part in webs of 10, 12, or 14 yards long and 18 inches broad; they range in the Cathmandu bazar from 1 rupee to 1 rupee 4 annas, and 1 rupee 8 annas per piece.

2. *Khadi.*—Thick, coarse, and strong; manufactured in considerable quantity in the valley of Noakote, as well as in the great valley and throughout the hills. It is much worn by the cultivators of all tribes, Parbutteahs and Newars. It comes to market generally in pieces of 6½ yards long, 16 or 18 inches broad, and averages at Cathmandu from 12 annas to 1 rupee per piece. It wears long and well; like the above it is sold unbleached.

3. *Purabi Chint.*—It is an imitation of Indian chintz manufactured at Dunkutuah, and other places in the eastern hills, generally coloured black and red in a small striped pattern; it is coarse and heavy; it is much worn by the poorer Parbutteahs, and Newars, (women). It comes to Cathmandu in pieces of 5 yards long, and less than two feet broad, and may be generally bought for 14 annas, or 1 rupee per piece.

4. *Mumi Chint.*—Also manufactured at Dunkutuah, and to the eastward; it is very like the above; it is worn by the Parbutteah and Newar women made into chulis, (boddice), and saris. A piece of 6 yards long and 18 inches broad, costs in Cathmandu about 1 rupee.

5. *Banarasi Chint.*—Manufactured at Bhatgaon in the valley, and named from its being an imitation of the Indian chintzes; it is of different colours and patterns, not so coarse and heavy as the

* The specimens here described are deposited in the Society's Museum.

other kinds, but thin and flimsy. It is used as lining for jackets, and for women's dresses. A pieee yards long and half a yard broad, costs in Cathmandu about from 1 rupee to 1 rupee 8 annas.

6. *Kalu Chint.*—Manufactured chiefly in the hills west of Cathmandu. It is coarse, heavy, very rudely dyed and printed, but the broadest of the Nepalese fabrics. A piece 8 yards long by 2½ feet wide, costs about 1 rupee 8 annas.

7. *Durkeah Chint.*—Manufactured principally at Pokra and But[illegible]; it is very coarse and heavy, but has a better width than the chintzes of the valley; it is used for jacket linings and women's dresses; it is six yards long and two feet broad, and costs in Cathmandu about 1 rupee 8 annas.

8. *Butedar Chint.*—From its spotted pattern it takes its name; it is a favourite one of the Bhatgaon chintzes. A piece of 5½ yards long and half a yard wide, costs about 1 rupee 8 annas.

9. *Hara Chint.*—It comes almost exclusively from the small valley of Bunapa, 20 miles east of Cathmandu; it is coarse and hard, like the rest.

10. *Purabi Kadi.*—Manufactured in the eastern hills; is broader, and somewhat finer than the Noakote article, (No. 2). A good deal of this article is exported from Nepaul to Bhote. A piece of 14 yards long and 2½ feet wide, costs at present in Cathmandu 3 rupees.

11. *Kasa.*—A Nepalese imitation of the Indian mulmul or common gauze, a wretched manufacture. It is made in large quantities at Bhatgaon, and generally by the Newars throughout the valley. It is used for making turbans. A piece of 8 yards long and 6 inches wide is sufficient for a pagri, and costs generally 4 annas. It is worn by the poorer Parbutteahs and some Newars, for the Asiatic turban is not generally among this latter race, a small conical skull cap, being the most common head-dress among them.

12. *Bhangrá.*—A very coarse and strong sackcloth or canvas, manufactured from the inner bark of trees, by the people of the hills, and much used in the valley of Nepaul, for making grain bags and sacks, for the transport of merchandise. The poorer people of the hills who subsist chiefly by wood cutting and car-

rying, make this cloth in their houses and wear it. I cannot at present ascertain the description of trees whose bark is converted into this clothing, nor the detailed process employed in making it into thread. The hill people say that several different trees furnish the appropriate bark, and that it is necessary to beat and pound it, as for paper making,* previous to spinning it into thread. The cloth is exceedingly strong and durable, and is said to stand wet for a long time without being rotted or injured in texture. It is brought to Cathmandu in webs of about five yards long and 12 inches broad, which costs on an average 8 annas.

13. *Rhari.*—A coarse kind of woollen blanket manufactured by the Bhoteahs of the Nepaul hills, and worn by them almost exclusively; it is brought to Cathmandu in pieces of 7½ yards long, and 14 inches wide, and costs about three rupees. Its texture is very thick and heavy; but it is admirably suited for the rainy season to the inclemency of which the burden-bearing and wood-cutting Bhoteahs are much exposed. The Newars do not wear this, nor indeed, (as a general practice), any woollen garments. This is also for the most part of domestic manufacture; as every Bhoteah who possesses a few sheep, has a web or two of it made up annually by his family. To add to the warmth and thickness of the rhari, it is frequently improved by beating wool into it, which gives it the appearance of felt.

14. *Bhote.*—It has its name from that of the people making and weaving it. The hill countries north of Noakote and the valley of Nepaul, up to the snows, produce this article. It is a thick and soft woollen stuff, half blanket, have felt, much warmer and lighter than the rhari, but inferior to it as a protection against rain. A piece 7 or 8 yards long by 8 inches wide, costs in Cathmandu about 2 rupees 8 annas.

P. S. On submitting the above to Mr. Hodgson's perusal, he informed me of the existence among the Newars of some coloured cotton manufactures overlooked by me in this list. I have procured specimens of them, and of an unnoticed plain manufacture both of which are added; they are as follows:—

* See the Nepaul paper making process as described by Mr. Hodgson in the Journal of the Asiatic Society.

15. *Putasi.*—So called by Newars. It is a strong coarse sort of check, generally blue and white, sometimes red and white; it is entirely a domestic manufacture, and very rarely procurable for purchase in the bazar, the women not weaving more of it than suffices for their own wear. It is worn exclusively by the Newar women: a piece 5½ yards long, and 2¼ feet wide, costs about 2½ current rupees. There are several varieties of this stuff as to colour and pattern, (some of them being striped instead of checked), but all are coarse and heavy.

16. *Punika.*—An imitation of the table cloth manufacture of Dinapore, and the variety technically called "Bird's eyes." Three or four sorts are manufactured by the Newars, but all, save one, are coarse and heavy. It is worn by the better class of Newars, male and female, and by the Parbutteah soldiery occasionally. A web of 6 yards long by 2 feet broad, costs 3 current rupees. The manufacture of this article is confined principally to the larger towns of the valley.

17. *Bhim Paga.*—(Newari.) An ancient manufacture and an article of clothing of the Newars, but not worn by them in the present day. It is worn only by a class of outcasts and is with difficulty procurable. Its only use at present is to roll the corpses of religious persons in, previous to being burned. The warp is of coarse cotton thread, the woof soft spun woollen yarn in addition to which, some fine wool is amalgamated with the web in weaving it. Its texture is very soft, and it is well calculated for a warm in door wear. It is too fleecy to keep out wet. A piece of 4 feet long by 2 feet wide, costs 2 current rupees.

(Signed) A. CAMPBELL,
Offg. Assistant Resident.

Nepaul, July 21, 1836.

III.—*Suggestions for the Establishment of Branch Societies throughout India.* *By* H. Walters, *Esq.*

[Read 11th January, 1837.]

MEMORANDUM.

My object in addressing the Agri-Horticultural Society at its last sitting, was merely to move the Society to stir up the mofussil authorities to exert themselves to establish Experimental Gardens at each Sudder station throughout the country.

We have an unbounded extent of country, differing in essential points, as to soil, climate, &c. That every plant will grow equally well in every place, it would be an absurdity to expect. But as yet, we *do not know* what are those peculiarities of soil, heat, moisture, elevation or lowness of site, and those other unexplainable modifications of soil and climate, to be found in our Bengal districts, which are most favourable to the production of the *commonest* articles of *native cultivation even;* much less to the growth of those improved varieties of staple products, which it is the great object of the Society to introduce.

The same districts will often contain spots extremely favourable and extremely unfavourable to the production of the same article. In the Dacca district, for instance, on the banks of the Megna at Chandpore, is a soil which produces and ripens the finest oranges, perhaps, in India. But they will not thrive in any other part of the district, or on the opposite side of the river the Tipperah district. (By the bye, why are there no *hares* on the Eastern shores of the Megna?)

At Chittagong too, on the banks of the Kurmphoolee at Howlah, extremely fine oranges are produced, and there only in that district. Howlah was, by tradition, formerly the site of a hill, which sunk and assumed something the shape of an extinct crater. Nowhere else in Bengal, I believe, will oranges thrive, except on a particular tract of small extent, on the verge of the Cossyah hills, which supplies Calcutta with the commonly called, Sylhet oranges.

The tobacco of Sandoway in Arracan, again, grown in a

confined space on the shelving bank of the river, has acquired deserved celebrity. And on a particular part of the estate of MR. ELIAS, an Armenian gentleman in Burdwan, roses are produced in the greatest abundance and perfection, and rose water has been manufactured equal to that of Ghazipore.

Now, what are the peculiarities, which have led to the above (and a hundred similar) results? And why with such, and similar facts before us, should we despair of perfecting in *some part* of the *country or other, whatever* we may wish to introduce? Why should we not *endeavour* at least, by *actual experiment all over the country*, to ascertain the localities *best* suited to the improved cottons, sugars, coffees, silks, safflower, indigo, &c. &c. we are desirous of growing? Peculiar localities *will* be found, that are favourable to the growth of particular products; but till we ascertain by *actual experiment, what* localities are favourable to *what crops*, we shall never properly develope the resources of the country. The failure of Marhatta ditch experiments only proves the justness of the position!

What I propose then, is, that the Agricultural Society of India, should address Circulars to all the Commissioners, and through them, to all the Collectors and Magistrates, pointing out the high importance to the country in general, of improving agricultural produce; and requesting them to solicit the co-operation of all the civil and military officers, the indigo planters and merchants, and the most intelligent and influential Native gentlemen, residing there or in the neighbourhood, in the formation of a Branch Agricultural and Horticultural Society, and the establishment of an Experimental Garden at *each* station; also in the collection of information as to peculiar localities, found by experience to be especially favourable to the production of particular products; in the distribution of seeds, (to be supplied by the Society), for trial to different persons residing in different parts of the district; and generally, in the furtherance and promotion of the objects of the Parent Society.

And with a view to this end, it appears to me essential, (mofussil officers not having much leisure for such pursuits), that a few plain rules for the first establishment of such societies should

be drawn up by the Secretary, printed and distributed; and that an Address pointing out the objects of the Society, and the benefits likely to accrue from it, &c. should be circulated for the information of the European and Native residents in the several districts, in English, Bengalee, and Hindoosthanee.

A copy of the rules established in the Hooghly and other Branch Societies in the 14th division, is, I believe, in the hands of the Secretary. They might, perhaps, answer, with some modifications for general adoption. The paper I presented to the Society, might possibly answer also, as the ground work of our address to the European and Native residents.

The Branch Societies once established, and Secretaries appointed, (the medical officers at the different stations will, generally, be found willing to act, and they usually have qualifications and leisure for the office), gradually, questions, (in small doses), might be circulated through them to intelligent planters, zemindars, and others, relative to the products, soils, manures, modes of cultivation, peculiarities, implements used, &c. &c. in the several districts. A mass of information might thus be gradually collected, of great importance to the future improvement of the country.

A museum of implements and machines, used in the cultivation of the soil, and the various processes of the farm yard, and also in the production of domestic manufactures, as found in use wherever our rule extends, might be formed; and specimens of all manufactures, connected with the agricultural products of the soil more particularly, might be collected. Such a museum would not fail to be extremely interesting, as well as useful; especially, if short descriptions of the manipulation and processes observed by the Natives in their different arts, were also compiled. The implements, 'dustoors,' and processes of one part of the country of superior ingenuity, convenience, or economy, might thus be readily introduced, through the instrumentality of the Society, into other parts, where agricultural, and its sister arts and sciences are in a less advanced state; and many useful implements, now confined to particular localities, would thus be made available for the general benefit. In Arracan, for instance,

a hand-mill for husking rice is in use, which is infinitely superior to the 'dhekee' of Bengal; and other implements and 'dustoors' might be borrowed from the Mugs with great advantage.

But with such a collection of implements and machines before him, a scientific and ingenious mechanist, might readily remedy the defects of one by engrafting on it the advantage of another, or by bringing to bear on it the results of his European science and experience. And it is, I am convinced, by adding simple improvements to the implements and machines *already in use*, and not by attempting the introduction of *foreign ones*, that we shall *really benefit* the mass of the people. An English plough may be found to answer very well in the hands of an English planter. But neither would a native be able to appreciate the advantage of *ploughing* instead of *scratching* the soil, nor would his cattle be able to draw the plough. What is wanted, is, improved *implements adapted to find their way into every village.*

In like manner, simple improvements on the native methods of dyeing, calico-printing, weaving, sugar-refining, tobacco-curing, might be introduced, and taught the people at the different sudder stations.

Schools of Arts, attached to our different Collegiate Establishments at the principal cities throughout the country, would be a vast acquisition.

Then again, while we look mainly to the improvement of *exportable* products, we must not neglect the improvement of the domestic comforts of the people.

In Bengal, every thatched cottage with its cattle shed, is shaded by a grove of bamboo, mangoe, jack, or other trees. The cottages are always erected on natural or artificially raised 'beetas,' and there is always a little space around them, where choice crops are produced. You see small patches of tobacco, bits of kuddoo or kutchoo cultivation, a few brinjals or egg plants, and the like. Now, why should not a few *coffee bushes*, a little patch of arrow root, a bit of Guinea or Angola* grass for

* Provide a sufficient supply of fodder and then the improvement of the breed of horned cattle and sheep would follow. Look at the advantages

 which

their oft starving cattle, be added to their little domestic comforts? The Mahomedans are very fond of coffee. The Hindoos have no objection to it. Its introduction might lessen the use of ardent spirits, an evil which is daily extending, though the revenue from licences to manufacture and sell it, is daily diminishing. Arrow root would be food for their infants of a day old, their old women of 80, their sick and infirm. While to save their cattle from starving and to keep them in good working condition, would be to add materially to the wealth of the ry*u*ts: not to mention the increased supply of milk from their cows, and the profit from the dhye and ghee. Now there is really no *difficulty* in all this. All that is required is, that *some one* should take an *interest* in these matters at *each station*, and that there should be a *depot* from which the necessary seeds and plants should issue, *without charge* to *all* who will take them. The natives are *not* backward in taking advantage of such opportunities. At Chittagong, thousands of tobacco plants, Virginia and Persian, were taken away from the Experimental Garden directly they were fit to transplant; cuttings of Otahitee sugar-cane in the same manner; and Guinea grass and arrow root are now spread all over that district. The latter is dressed by the Natives in curry as well as used as a jelly; and it is infinitely superior to their kuddoos and kutchoos. The coffee too, has been successfully introduced. In the Moorshedabad division also, I have no doubt, all these things will get abroad in a year or two; and so they will, *wherever* the *Natives have the means of procuring them*. Ask any Zemindar of opulence in the mofussil; why don't you plant this, that, and the other? His reply is, *Where am I to get them from?* who will *give me seed, charahs*, &c.? Potatoes are now grown all over the country, and are become a staple food for the people. Cabbages and cauliflowers are exposed for sale in Native bazars at most of the considerable towns in the interior. And peas for their own table are cultivated by some land-holders. Leechees and loquots are common in the gardens of Na-

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which have attended the introduction of these grasses in the West Indies, in Jamaica especially. The Government have improved the breed of Horses, but they grow oats to feed them with.

tives. But, twenty years ago, these things were rarities. The Jerusalem artichoke and the 'mistah' or Hibiscus, might be introduced more largely with advantage. The latter is cultivated by the Mugs in considerable quantity. Turnips,* beet root, parsnips, might also be introduced with advantage as food for man and beast. Native carrots are grown in the upper provinces; and the European varieties might be introduced with advantage more largely.

Experience has shewn, then, that there is no insuperable prejudice on the part of the Natives in availing themselves of improved products, when they see that they can be readily produced; but they will *not adopt them hastily.* They must be put in their *way*; they must see them growing; they must be taught the use and the mode of preparing them for the table; they must taste them; must see others eating and using them, and gradually, when they find that they are *not poison,* but really *good* for the use of food, they will adopt them themselves. In the Burdwan Raja's garden, I saw quantities of arrow root plants; I found they had been growing for 3 or 4 years undisturbed. I mentioned to the Raja that they should be taken up when the leaves withered, and the bulbs be pounded, washed, strained and dried; he brought me some good arrow root flour to taste. In passing down again through his district the other day, he told me he would have quantities of it made for his household. He did not know what it was, or how to use it before; but without some plain instructions, *how are* people to learn?

A Dutch Boor at the Cape told me he had tried coffee on his estate. He had put *plenty* of *seed* in the ground, but it was 'good for *nix*,'† for he waited a month, and it would not come up. So he turned up the ground, and planted something else, and he was *quite convinced coffee would never grow at the Cape.* I told him to try again, and to wait *three* months, and then his seed would come up. He would not kill his cow, I supposed, because

* Turnips are called salgrum in Hindoostanee. Many Hindoos will not eat them, because of the similarity of the name to the salgram or pebble which they worship, or use in worship.

† Nothing.

she would not calve in *six* months. "He did not understand *that*, he said, and when he got more seed he would try again, and "wait the time." So, with the Bengalee, who is not the only ignoramus in the world. Shew him the *way* and the *profit*, and he will follow.

I propose then, that a circular be drafted, that a few plain rules be drawn up, that every effort be made to establish a Branch Society and Experimental Garden at every Sudder Station throughout the country; that Government, should it be needful, be applied to, to give the plan sanction and encouragement by allowing correspondence on the subject, to pass free under signature of Secretaries, i. e. from Secretary to Secretary, and to permit packets of seeds to be forwarded to the Branch Societies on the steamers, free of charge. That Mr. BELL be kind enough to prepare the necessary papers and submit them to the next meeting. I have not time either to draw up the papers myself or attend on Committee, except it should be absolutely necessary for an hour. But I have fully said my say in this long-winded memorandum, for which I beg to apologize.

Another part of this subject, the establishment of a Medico-Botanical Garden at each Sudder station, must be reserved for future submission to the Society. There are numerous simples used extensively in medicine, as senna, rhubarb, chiretta, and other bitters and febrifuges, jalap, ipecacuhana, gentian, &c. &c. which either grow naturally, or could be acclimated in this country, which would nearly supply *all* the wants of our mofussil hospitals, and which would prove a saving of vast expence to Government, in articles of medicine now imported from England. Where are the medical students to obtain European medicines when they finish their education in the Medical College, and set up as practitioners on their own account in the mofussil? But more of this hereafter. It is a subject that should be taken up seriously by Government in my humble idea of the matter.

H. WALTERS,

December 24th, 1836.

IV.—*Correspondence relating to* DR. HELFER'S *Mission to the Provinces on the coast of Tenasserim.*

[Read 11th January, 1837.]

To JOHN BELL, Esq.

Secretary to the Agricultural and Horticultural Society.

SIR,

The Right Honourable the Governor of Bengal having deputed DR. HELFER to the provinces on the Coast of Tenasserim, for the prosecution of scientific enquiries connected with Natural History, I am directed to request that you will lay before the Society with the least possible delay, (as the vessel upon which DR. HELFER purposes to embark, is on the point of sailing), the accompanying extract from a letter this day addressed to Mr. Commissioner Blundell, from which they will perceive that His Lordship has ventured to reckon upon their cordial co-operation in the important objects of the former Gentleman's mission. He doubts not that the Society will gladly meet his wishes to the extent of the views for which they are associated, and he therefore has instructed DR. HELFER to place himself in communication with them, in order that he may receive any aid or directions with which they may be pleased to favour him.

I am,

SIR,

Your most obedient servant,

R. D. MANGLES,

Sec. to the Govt. of Bengal.

Fort William,
3rd January, 1837.

Extract from a Letter this day addressed to the Commissioner of the Tenasserim Provinces.

Para: 12.

MR. PEARSON,	Zoology.	
MR. JAS. PRINSEP,	Mineralogy and general physiology and research.	
DR. WALLICH,	Botany.	

From the Gentlemen whose names are mentioned in the margin, Dr. HELFER will receive notes descriptive of the objects of research and investigation in the departments of science with which they are severally most familiar. By Dr. WALLICH, and by the Agricultural and Horticultural Society, he will also be furnished with seeds and with plants of the best species of cotton, of the sugar-cane, the coffee plants, gambia, tea, white mulberry, arrow root, indigo, cardamum, and varieties of spices, and of whatever in vegetable nature may be valuable to the provinces under your administration. On the other hand, he will enrich the Botanical Garden, and that of the Agri cultural and Horticultural Society, with specimens of those valuable plants which attain to superior excellence in Tenasserim.

(True Extract.)

(Signed) R. D. MANGLES,

Sec. to the Govt. of Bengal.

To ROSS D. MANGLES, Esq.

Sec. to the Govt. of Bengal.

SIR,

I have the honour to acknowledge the receipt of your letter of this date, annexing Extract of a letter to Mr. Commissioner Blundell, and desiring me to lay the same before the Society with the least possible delay.

2d. I beg to assure you that I shall lose no time in complying with your request, but as you represent that the vessel on

which Dr. HELFER intends proceeding, is on the eve of departure, I have taken upon myself the agreeable task of directing the immediate supply of cotton and other seeds to be arranged and packed, so that they may be at Dr. HELFER's disposal in the course of to-morrow, being perfectly satisfied that I am merely anticipating the feelings of the Society to render Dr. HELFER their most cordial co-operation in the objects of his mission.

3rd. I shall also have taken up from my garden some bulbs from the plant of real West India Arrow Root, brought out to this country by Lord AUCKLAND, as well as some roots of West India Ginger, the first, I believe, grown in India.

I have, &c.
(Signed) JOHN BELL,
Secretary.

Agricultural Society's Office,
January 3d, 1837.

On the same subject by Dr. HELFER.

[Read 8th February, 1837.]

To JOHN BELL, Esq.
Secretary to the Agricultural and Horticultural Society.

SIR,

I have the honour to acknowledge the receipt of the cases No. 1, 2, 3, two large and a small bag, with seeds furnished by the Agricultural Society, made, with reference to the communication of the 3rd instant from the Secretary, R. D. MANGLES, Esq. in the Judicial and Revenue Department, use them in the Tenasserim Provinces, where I am proceeding in the capacity of Naturalist, sent by the Government of India.

You may be assured that I will strictly follow the prescription regarding their cultivation, chiefly of the most important; and that I will distribute them wherever I may find that they will be appreciated and prove useful.

I have the honour to be, Sir,
Your very obedient servant,
J. W. HELFER, M. D.

8th Jan. 1837.

V.—*Enquiries concerning supplies of Otaheite Sugar-cane.*

[Read, 8th February, 1837.]

To J. Bell, Esq.

Secretary to the Agricultural and Horticultural Society.

Sir,

I am directed by the Right Honourable the Governor of Bengal, to transmit to you the accompanying copy of a letter, No. 3409, from the Acting Secretary to the Government of Bombay, dated the 12th instant, with its enclosure, and to ask whether the Society have any plants of the description of cane in question available, or can suggest any means of supplying the wants of the Bombay Government.

I am,
Sir,
Your obedient servant,
H. T. PRINSEP,
Sec. to Govt.

Fort William,
The 28th December, 1836.

To W. H. Macnaghten, Esq.

Secretary to the Government of Bengal.

Sir,

I am directed to transmit to you the accompanying copy of a letter from the Revenue Commissioner, dated the 28th ultimo, and to beg you will submit it to the Right Honourable the Governor of Bengal, with the request of the Right Honourable the Governor in Council, that His Lordship will be pleased to cause the requisite instruction being issued for a supply of the 'Otaheite cane' being forwarded to this Presidency by the earliest ship opportunity; and also for the transmission by bangy dawk of a small quantity to the Collector of Ahmednuggur, di-

rect, from any of the provinces of the Bengal Presidency in which that species of cane may be grown.

I have, &c.

(Signed) E. H. TOWNSEND,
Acting Sec. to Govt.

Bombay Castle,
12*th December*, 1836.

To W. H. Wathen, Esq.
Chief Secretary, Bombay.

Sir,

Having been informed that a species of Sugar-cane, known as the 'Otaheite cane,' has, for the last two or three years been grown in some of the Bengal and Agra Provinces, and that it is found to be very superior, not only to the ordinary country canes, but even to that variety, the late introduction of which from Mauritius promises to confer so considerable a benefit on the agricultural and commercial interests of this Presidency, I have the honour respectfully to suggest that the Bengal Government be requested to procure from the growers some of the canes in question, for transmission to this Presidency. A few canes might be sent by bangy dawk to whatever Bombay station might happen to be nearest, probably Dhoolia from the Agra Provinces, and Ahmednuggur from Bengal, the Collector being previously advised of the intention to despatch them, in order that he might get a piece of ground ready to plant them immediately.

2nd. The canes should be carefully packed up in bangy boxes, being previously cut into pieces of two or three feet long, and the ends filled up with fine clay.

I have, &c.

(Signed) T. WILLIAMSON,
Revenue Comr.

Revenue Commissioner's Office, Poona,
28*th November*, 1836.

(True copy.)

(Signed) E. H. TOWNSEND,
Acting Sec. to Govt.

(True copies.)

H. T. PRINSEP,
Sec. to Govt.

To H. T. PRINSEP, Esq.
Secretary to Government.

SIR,

I am directed by the Agricultural and Horticultural Society to acknowledge the receipt of your letter, dated the 28th ultimo, with the copy of a letter from the Acting Secretary to the Government of Bombay and its enclosure.

2nd. With reference to the information required by the Right Honourable the Governor of Bengal, I have to express regret at the inability of the Society to supply the Government of Bombay with the description of Sugar-cane alluded to in the communication of the Revenue Commissioner at Poona, owing to disappointment experienced in the receipt of a recent consignment from Lucknow, which arrived in such a parched state, that the vegetating powers had ceased, and the plants in the Society's nursery at the Botanical Garden being too young to be available as cuttings.

3d. I have taken advantage of an offer made by Major SLEEMAN in his letter of the 9th May last, of which I have the honour to transmit a copy, to request that gentleman will take steps to forward a supply from his Jubbulpore plantation of Otaheite cane to the Collector of Ahmednuggur, after advising that functionary of his intention to do so. I have, &c.

(Signed) JOHN BELL.

Agricultural Society's Office,
Calcutta, 23*d Jan.* 1837.

To J. BELL, Esq.
Secretary to the Agri-Horticultural Society.

SIR,

I have the honour to acknowledge the receipt of your letter of the 23d ultimo with its enclosures, and to acquaint you that I have forwarded them to Lieut. CHARLES BROWN who has charge at Jubbulpore of the sugar-cane plantation, and will do all he can to meet your wishes on this and all other occasions.

There is a great abundance of fine canes available at the plantation for any one who may wish to have them; as I am told that they are as fine this season as in any preceding season, weighing many of them twelve pounds each, though all from the stock planted by me at that place in 1828. But the season is now too far advanced to send them to any great distance I fear, as they should be in the ground before the end of February.

I sent canes two years ago to Bhopaul and Kotah and Neemuch, where Colonel SPIERS has, I believe, taken care of them, and whence they might be easily supplied to Goozerat. I think I sent them also to Indore, but do not feel quite sure. But on camels they may be easily sent to Goozerat from the Jubbulpore plantation, where an abundant supply will always be available, and furnished at your order, free of all cost.

In November last, I sent a letter to the Delhi Gazette, offering canes to any person who would take the trouble to send to Jubbulpore for them, and giving a few instructions regarding the best mode of planting them, with a diagram. These I now enclose, but must beg you to do me the favour to return them to me at your convenience.

Many people from the upper provinces have sent for a supply, and a boat load in boxes is now on its way up on the Ganges from Mirzapore, for the Horticultural Gardens at Meerut, for the Dehra Doon and Sirdhana, besides a supply for these places on camels.

When I wrote to you about the bamboo, I was not aware, that there were two species of the large kind; one with a much larger leaf, less lateral shoots, greater substance in proportion to its circumference, and consequently less hollow space within. This is much more prized by the people than the other, as it affords more substance for use, and that substance is much more easily worked. The bamboo which died this season at Dehra was equally large and beautiful in appearance, but was the species with the smaller leaf, greater hollow, less substance, and more lateral shoots; and, if I may so call them, thorns. There are a good many of the clusters of the large leafed species still standing in the villages that border the Doon.

I may mention a circumstance which I omitted to notice in my former letter, regarding the bamboo. In the rains of 1835, my bamboos at Jubbulpore had not thrown out their shoots at what I considered the usual time, and I asked my gardener the cause. He replied, we have had no *thunder* yet; as soon as the thunder comes, you will get shoots. I asked him what possible connection there could be between the claps of thunder and the shooting of the bamboos. 'God only knows,' said he, 'but we know that till the thunder comes, the bamboos never shoot well.' The thunder came, and certainly the gardener's theory seemed to me to be confirmed by a very steady and abundant shooting of the bamboos.

May not the high cluster of bamboos attract the electric fluid, and conduct it to the roots; and may not electricity be a great agent in the astonishing rapidity with which the young bamboo grows? These were questions which I asked myself, and which it may be worth while to mention to you that they may be asked of others better able to answer them.

I have the honour to be,
Sir,
Your most obedient servant,
(Signed) W. H. SLEEMAN,
General Superintendent.

Mussooree, 11th February, 1837.

To John Bell, Esq.

Dear Sir,

I have learned from a letter from Lieut. Charles Brown, at Jubbulpore, to Lieut. Kirke, of this place, lately received, that some of the canes at the Jubbulpore plantation this season, weighed eight seers each, the seer being eight sicca rupees, about sixteen pounds each; and measured nine cubits. This shows that the canes have not deteriorated; for I do not believe that the canes of the plantation from which the original stock was taken by me in January, 1827, weighed more.

Yours faithfully,
W. H. SLEEMAN.

Dehra, 20th February, 1837.

P. S. I think I mentioned to you that I have not yet taken canes from the same roots for more than two seasons: and I should mention that even in the second season the canes fall off much in size, unless the land is very strong and well manured.

VI.—*On the growth of plants without open exposure to air.*

(Read 8th February, 1837.)

To J. Bell, Esq.

Secretary to the Agricultural and Horticultural Society.

My dear Bell,

Do me the favour to lay the accompanying interesting little Memoir, by Mr. N. B. Ward, 'On the growth of plants, without open exposure to air,' before the meeting to-day.

The principle on which Mr. Ward proceeds, has been acted upon for several years, in the transmission of plants to and from India, with complete success. It was first adopted in respect to plants forwarded to this country by Messrs. Loddiges, of Hackney, in 1834. I will hereafter submit an outline of the mode of packing plants, in conformity to the above plan.

Yours sincerely,

N. WALLICH.

Calcutta, 8th February, 1837.

Letter from Mr. N. B. Ward *to Sir* W. J. Hooker, *on the growth of plants without open exposure to air. Published in the "Companion to the Botanical Magazine," for May,* 1836.

Wellclose Square, London, March, 1836.

My dear Sir,

I have lately heard that you wish for some information respecting my new method of growing plants without open exposure to air. As I do not intend to publish at present a detailed account, and as much misrepresentation exists upon the subject, I feel

great pleasure in furnishing you with the principal facts, of which you may make any use you please.

The depressing influence of the air of large towns upon vegetation, had, for many years, engaged my attention.

The science of Botany, in consequence of the perusal of the works of the immortal Linnæus, had occupied me from my youth up, and the earliest object of my ambition was to possess an old wall, covered with ferns and mosses. Compelled by circumstances to live surrounded by, and enveloped in, the smoke of numerous manufactories, all my endeavours to keep my favourites alive, proved sooner or later unavailing. I was led, however, to reflect a little more deeply upon the subject, in consequence of a simple incident, which occurred about seven or eight years ago. I had buried the chrysalis of a Sphynx in some moist mould, which was contained in a wide-mouthed glass bottle, covered with a lid. In watching the bottle from day to day, I observed that the moisture which during the heat of the day arose from the mould, condensed on the internal surface of the glass, and returned from whence it came, thus keeping the mould always equally moist. About a week prior to the final change of the insect, a seedling Fern and Grass made their appearance upon the surface of the mould.

After I had secured my insect, I was anxious to watch the development of these plants in such a confined situation, and accordingly placed the bottle outside my study window. The plants continued to grow, and turned out to be the *Poa annua* and *Nephrodium Filix mas.* I now commenced a series of experiments upon other plants, principally Ferns, selecting those that were most difficult of culture, such as *Hymenophyllum*, &c. My method of proceeding was as follows:—Keeping nature always in view, I endeavoured to imitate the natural condition of the plants as much as possible, as regarded the exposure to light, solar heat, moisture, &c. Thus, if Ferns were the subject of experiment, they were planted in the mould most congenial to them, well watered, but all the superfluous water allowed to drain off, and then placed in a situation having a northern aspect. If, on the contrary, I wished to grow *Cacti*, they were

planted in a mixture of loam and sand, suspended from the roof of the case, and fully exposed to solar heat. Upon this part of the subject I need not, however, dilate any further, and will therefore confine myself to the results obtained.

1st. That the depressing influence of the air of large towns upon vegetation depends almost entirely upon the fuliginous matter with which such an atmosphere is impregnated, and which produces the same effect upon the leaves of plants as upon the lungs of animals.

2ndly. That, owing to the quiet state of the atmosphere surrounding the plants in my inclosed cases, the plants, like human beings, will bear extremes of heat, and of cold, which under ordinary circumstances would be fatal to them. It is well known, from the experiments of Sir C. Blagden, and others, that man will bear great degrees of heat with impunity, provided the atmosphere be undisturbed, and it is equally a matter of fact, that the extremest cold of the Arctic Regions produces no bad effect, when the air is quite still. Mr. King, who has recently returned from Capt. Back's Expedition, informed me that the greatest degree of cold he experienced was nearly 70° below zero; that no inconvenience was felt at that low temperature, owing to the perfectly calm state of the air; but that if the wind arose, although the thermometer would likewise rapidly rise with the wind, the cold then became insupportable.

These facts I have proved in the one case, by the exposure to sun of *Hymenophyllum* and *Trichomanes;* and in the other by growing without heat, *Aspidium molle*, *Phœnix dactylifera*, *Rhapis flabelliformis*, *Dendrobium pulchellum*, *Mammillaria tenuis*, &c. &c.

3rdly. That owing to the prevention of the escape of the moisture contained within the cases, plants will grow for many months, and even for years, without requiring fresh supplies of water. Thus, in the first experiment, the *Poa* and *Nephrodium* grew for four years, without one drop of water having been given to them during that period, and would, I believe, have grown as many more, had they not accidentally perished in con-

sequence of the rusting of the tin lid covering the bottle, and the admission of rain-water.

4thly. That the degree of development to which the plants attain, depend mainly, *cæteris paribus*, upon the volume of air contained within the case, and upon the quantity of light and solar heat received by the plants. Thus to revert to the first experiment. The *Poa* and *Nephrodium*, being contained within a small bottle—the one flowered but once during its confinement, while the other did not produce any capsules. Both *Ferns* and *Grasses*, in my larger cases, flower and fruit well. *Phænogamous plants*, such for instance, as *Ipomæa Quamoclit* and *coccinea*, will not flower in a case exposed to the North, while in the same case, fully exposed to the South, these very plants come up from seed, and flower very well.

To sum up all, in every place where there is light, even in the centre of the most crowded and smoky cities, plants of almost every family may be grown, and particularly those which have heretofore been found the most difficult to cultivate. I have now, in a wide-mouthed bottle, simply and loosely covered with a tin lid, the following plants:—*Hymenophyllum Tunbridgense* and *Wilsoni*, *Trichomanes brevisetum*, *Hookeria lucens*, and other Mosses, *Jungermannia juniperina* and *reptans*, &c. &c. These plants have been enclosed for twelve months, and are growing most vigorously, although they have not once been watered during that period. In my other cases, the *Ferns*, *Palms*, *Orchideæ*, *Grasses*, many Monocotyledonous plants belonging to the families of *Scitamineæ*, *Bromeliaceæ*, &c. &c. grow very well; while, on the contrary, the continued humid state of the atmosphere is unfavourable to the development of the flowers of most of the *Exogenous plants*, excepting those which naturally grow in moist and shady situations, the *Linnæa borealis*, for instance, which I have had for more than two years, and which flowered twice last year in a situation where, without my protecting cases, the *London Pride* (*Saxifraga umbrosa*) ceases to exist after twelve or eighteen months.

This method will, I believe, assist the physiological Botanist in solving some points of great importance, connected with ve-

getation in general, such as the agency of various soils, the quantum of air necessary for the development of various tribes of plants, &c. &c.; and I shall be delighted in seeing the subject taken up by those who, with far greater knowledge than I possess, have likewise better opportunities of prosecuting these interesting inquiries. Occupied, as I have unceasingly been for the last twenty years, with the harassing details of general medical practice, and living constantly in town, I find it impossible to do all that I wish, nor could I have gone on thus far, but for the unbounded liberality of Messrs. LODDIGES, who from their ample stores, have most kindly furnished me with every plant I desired for the purposes of experiment.

I come now to the most important application of the above facts: that of the conveyance of plants upon long voyages. Reflecting upon the causes of the failure attending such conveyance, arising chiefly from deficiency or redundancy of water, from the spray of the sea, or from the want of light in protecting them from the spray, it was, of course, evident that my new method offered a ready means of obviating all these difficulties, and in the beginning of June, 1833, I filled two cases with Ferns, Grasses, &c., and sent them to Sydney under the care of my zealous friend, Captain MALLARD, copies of whose letters I have enclosed.

The cases were refilled at Sydney, in the month of February, 1834, the thermometer then being between 90° and 100°. In their passage to England, they encountered very varying temperatures. The thermometer fell to 20° in rounding Cape Horn, and the decks were covered a foot deep with snow. In crossing the line the thermometer rose to 120°, and fell to 40° on their arrival in the British channel, in the beginning of November, eight months after they were enclosed. These plants were not once watered during their voyage, received no protection by day or by night, but were yet taken out at LODDIGES' in the most healthy and vigorous condition. The plants chiefly consisted of Ferns, among them *Gleichenia microphylla*, never before introduced alive, and the *Hymenophyllum Tunbridgense*. Several plants of *Callicoma serrata* had come up from seed during the voyage, and were in a very healthy state. As this experiment

was made chiefly with *Ferns*, I will briefly give you an account of one other experiment, in which plants of a higher order of development were the subject of trial. Ibrahim Pacha being desirous to obtain useful and ornamental plants for his garden near Cairo, and at Damascus, commissioned his agents in this country to send them. I was requested by his agents to select them, and they were sent out in August, 1834, in the Nile Steamer, to Alexandria. They were about two months on their passage, and I have enclosed a copy of the letter from Mr. Traill, his gardener, giving an account of their condition when he received them; and have likewise sent you a list of the plants, which were contained in the Egyptian cases. I have, as yet, received no account of the Syrian plants. Various other trials have been made to other parts of the world, as Calcutta, Para, &c. &c. and with the same success.

I feel well assured that this method of importing plants would likewise be extremely useful in the introduction of many of the lower but most interesting tribes of animals, which have never yet been seen alive in this country.

In reply to an inquiry that was addressed to Mr. Ward, as to the adviseability of a collector's taking glazed boxes to Brazil, Mr. Ward thus writes. "I should imagine that these may be easily procured at Rio, and various other places; but if glass cannot be obtained, or is very dear, then a number of small panes might be carried, for use, as occasion requires.

"It may be as well to state, once for all, that the success of my plan is in exact proportion to the admission of light to all parts of the growing plants, and to the due regulation of the humidity of the mould wherein they grow. It is safer, in all instances, to give rather too little than too much water. If *Ferns*, for example, are the subject of experiment, they should be planted in the soil most congenial to them, well watered; but all the superfluous fluid allowed to drain off, before the case is finally closed; while on the other hand, succulent plants should be set in dry sand. I need not, however, dilate upon this, any further than by observing that the natural condition of the species should be imitated, as far as possible, except in the free exposure

to air. The smaller species of *Cacti* will travel well, suspended in my cases, without any mould. The larger species, according to LODDIGES, should be packed in very fine and dry sand. All vegetable matters, used as package, are very injurious.

"You ask how the tropical *Orchideæ* may be best conveyed: —most certainly in the glazed cases: I believe, that, thus secured, ninety-five out of every hundred may be imported in a vigorous state from any part of the world, provided the voyage does not exceed eight or ten months in duration.

"In all instances, the plants require no attention during the voyage; the sole care requisite being to keep them in the light.

"You next enquire, what plan I would suggest, where glazed boxes are not procurable, and here I must give you higher authority than my own, that of Messrs. LODDIGES, who find the means adopted by your American correspondent, the most eligible, viz. that of packing them in moderately moist *Sphagna*: —always excepting the succulent plants.

"Would it not be advisable to direct the attention of your collector, particularly, to the introduction of such plants as have never yet been seen alive in this country, owing to the impossibility of importing them in the old method? Every species of *Trichomanes* and *Hymenophyllum* might thus become inmates of our stoves, as well as a number of other interesting plants, which possess oily nuts or seeds, that quickly lose their germinating property, after they are ripe. These seeds might be sown in the mould among the other plants, and would come up during the voyage. All the *Palms*, the *Bertholletia*, &c., would succeed admirably in this way.

"I may remark, that there is one point, upon which misconception exists very generally, even among well informed men. Because my cases are made quite tight, it is imagined, that the plants contained in them receive no change of air. Now, it must be obvious to every one who reflects for an instant on the subject, that owing to the expansibility of the air by heat, there must, with every change of temperature, be a corresponding change in the volume of air contained within the cases.

Without such a variation, the plants would, in all probability, soon perish."

N. B. WARD.

SIR, *Hobart Town, Nov. 23d,* 1833.

You will, I am sure, be much pleased to hear, that your experiment for the preservation of plants alive, without the necessity of water, or open exposure to the air, has *fully succeeded.*

The two boxes entrusted to my care, containing ferns, mosses, grasses, &c., are now on the poop of the ship (where they have been all the voyage,) and the plants (with the exception of two or three ferns, which appear to have faded) are all *alive* and *vigorous.*

During the very hot weather near the equator, I gave them once a light sprinkling of water; and that is all they have received during the passage.

All the plants have grown a great deal, particularly the grasses, which have been attempting to push the top of the box off.

I shall carry them forward to Sydney, according to your instructions, and have no doubt of delivering them into the hands of Mr. CUNNINGHAM in the same flourishing state in which they are at present.

Allow me, in conclusion, to offer you my warm congratulations upon the success of this simple but beautiful discovery for the preservation of plants in the living state upon the longest voyages; and I feel not a little pride in having been the instrument by which the truth of your new principle has been fully proved by experiment.

I am, Sir, &c. &c.
CHARLES MALLARD.

Barque Persian, at Sydney,
SIR, *Jan.* 18*th,* 1834.

I have the happiness to inform you, that the plants (ferns, mosses, &c.) contained in the two glazed cases entrusted to my care, were landed here at the Botanical Garden about three

weeks ago, nearly the whole of them alive and flourishing. They have since been transplanted by Mr. M'Lean, who has charge of the garden in the absence of Mr. Cunningham, (gone to New Zealand botanizing), and are all doing well.

The complete success of your interesting experiment has been decidedly proved; and whilst offering you my congratulations upon this agreeable result, I cannot but feel some little degree of pride and pleasure in having been the instrument selected to put to the proof so important a discovery to the botanical world.

I am, Sir, &c. &c.

Charles Mallard.

P. S. I ought to have mentioned that, during the voyage, the plants were watered but once, and that but a light sprinkling near the equator, and were on deck (on the poop) the whole passage.

Sir, *Cairo, April 30th,* 1835.

I beg to acknowledge the receipt of your letter of 2d ultimo, wherein you request information as to the state of the plants sent out by you in the Nile steamer. The collection consisted, I believe, of 173 species, contained in six glazed cases, two of which only were forwarded to me from Alexandria. The one which you mention as having been fitted up with talc, together with three others, were sent on to Syria immediately on their arrival in Alexandria, so that I had no opportunity of seeing them.

I have, however, the pleasure to inform you, that the Egyptian portion of the collection was received here in the very best condition: the plants, when removed from the cases, did not appear to have suffered in the slightest degree; they were in a perfectly fresh and vigorous state, and, in fact, hardly a leaf had been lost during their passage. Your plan, I think decidedly a good one, and ought to be made generally known.

I am, Sir, &c. &c.

J. TRAILL.

List of plants contained in the two cases sent to Egypt.

Achras Sapota.
Aleurites triloba.
Alpinia nutans.
Anona Cherimoyer.
Bignonia venusta.
Bombax Gossypium.
Brexia spinosa.
Caryota urens.
Cedrela odorata.
Combretum comosum.
Croton variegatum.
Curcuma longa.
Cycas revoluta.
Dalbergia scandens.
Dimocarpus Litchi.
Diospyros cordifolia.
Diospyros edulis.
Diospyros embryopteris.
Doryanthes excelsa.
Dracæna terminalis.
Dracæna edulis.
Erythrina crista-galli.
Ficus elastica.
Flacourtia cataphracta.
Franciscea uniflora.
Gomutus saccharifer.
Jatropha panduræfolia.
Jonesia pinnata.
Ixora coccinea.
Latania borbonica.
Laurus Cassia.
Laurus Cinnamomum.
Maranta arundinacea.
Maranta zebrina.
Maranta bicolor.
Melastoma Fothergilli.
Menispermum Cocculus.
Melaleuca cajeputi.
Mimusops Elengi.
Morus tinctoria.
Myrtus Pimenta.
Oreodoxia regia.
Pandanus odoratissimus.
Passiflora racemosa.
Piper Betel.
Piper nigrum.
Psidium chinense.
Terminalia angustifolia.
Uvaria odoratissima.
Vanilla planifolia.
Zingiber officinale.

Note by Mr. J. W. Masters.

The very ingenious method of transmitting plants from one country to another in closed cases, first recommended by N. B. Ward, Esq. F. L. S. has been attended with the most satisfactory results. Timber trees, fruit trees, shrubs, and herbaceous plants have travelled from England to India in closed cases, and have arrived in the most perfect state of health and vigour.

The first closed chest of plants received at the Company's Botanic Garden arrived December 13th, 1834, per *Asia*, Captain BIDDLE, having been sent out through the kindness of Messrs. C. LODDIGES and SONS. The following observations made by Dr. WALLICH at the time of opening the chest, I extract from the "Plants received book," December 13th, 1834.

"A closed chest, (I think one of my own), completely shut up, and almost hermetically, some panes defended by iron bars in each cover. The plants were in beautiful condition, only somewhat drawn, and blanched; not a drop of water had they during the whole voyage, and the orders were to keep the chest out in the sun all the time. About six inches of sphagnum, (Bog-moss), which was quite wet, as if it had just been taken out from a bog; most of the plants in small pots plunged deep into the moss, very little appearance of rottenness or mouldiness comparatively speaking." The second closed chest arrived Nov. 20th, 1835, per *Windsor*, Capt. HEMMING, forwarded by the same liberal contributors as the first. The following observation was made by me on opening the chest, Dr. WALLICH being absent on deputation to Assam.

"A tin box, covered by a glazed top, closed nearly air tight and locked with two locks, had stood out in the sun all the voyage; all the plants in most excellent condition, scarce a leaf withered." The same box was filled with plants at this garden together with another common glazed chest; both were closed, and embarked on board the *Windsor*, Capt. HEMMING, having kindly undertaken to deliver them safe to Messrs. LODDIGES and SONS, who, in a letter dated Hackney, 23d July, 1836, acknowledge the receipt of them in the following words, "We have to thank you most heartily for the plants which arrived in very fine order, fully establishing the efficacy of glazed boxes for the preservation of them on long voyages." "Capt. HEMMING having most generously offered to take some thing out, we have addressed two more glazed boxes to you, they are filled with a variety of plants." These two cases arrived Nov. 11th, 1836. The plants were in a most thriving condition, superior to any we had before received.

Extract of a letter from Capt. JENKINS, *dated 25th June.*

DEAR SIR,

Yesterday I landed the three chests of plants you sent up by my boat. The plants have had a long passage, and the heat latterly has been great. On the whole the experiment may be said to be very successful, for I have had delivered a good number of plants which came packed in a space of small dimensions. I cannot however but again advert to the up-country plan of carrying plants, and strongly recommend you to get the Horticultural Society to order some plants down from Cawnpore, Agra or Allahabad, that the Society may have a practical proof of the efficiency of the native system of transportation. I am satisfied that in the space of one of your boxes, the native gardeners would have conveyed to this from 3 to 400 plants, and that not one in a hundred would have died. The only expense attending the transportation would have been a cooly or two to renew the leaves. I think the subject is well worth your notice and the Society's. If generally introduced, consider with what facility we might have all kinds of plants transferred from one part of the country to the other. Suppose you wanted to supply young coffee plants for a plantation, how readily might they not be furnished. Sugar-cane might of course very readily be sent in the same manner. Orange plants above all others are of ready transportation; and the Society might get as a trial two or three cooly loads from Agra, of oranges, limes, and peaches. If the plants were conveyed by hired servants instructed in their mode of management, the expense would not be more than an anna or two for each plant sent from Agra to Calcutta by land carriage.

I am, yours faithfully,

(Signed) F. JENKINS.

Mr. MASTER,

Honourable Company's Botanical Garden.

VII.—*Account of the distribution of American Cotton Seed, by Colonel* Dunlop.

[Read 8th February, 1837.]

Camp Mahomedabad, 19th December, 1836.

My dear Sir,

I have been a good deal occupied or should have written to you sooner to tell you of the distribution I have made of the cotton seed: from Allahabad upwards towards Cawnpore I gave out daily several seers of it to the zemindars who were extremely desirous to get it. At the Civil station of Futtehpore I gave Mr. Rivaz, the Judge, several seers of the three kinds, and at Cawnpore, I sent to Mr. Turner, the Commissioner, about a maund of each of the three sorts, beside a small quantity to Colonel Presgrave for the purpose of being taken to Saugor, for which station he proceeds next month. I have reserved about five seers of the three sorts to give out to any native gentleman zemindar as I pass upwards.

The enclosed letter from Lieut. William Stewart, the Fort Adjutant of Chunar, shows how anxious he is to make himself useful to the Society. What he got was part of that sent to Capt. Watt, the remainder of it has been sent up to Agra to the care of Mr. N. Wright, whom I shall see in eight or ten days hence.

While at Cawnpore I met Mr. Stevenson, the Surgeon from Lucknow; he has an ample supply of the sugar-cane; you ought to get it sent from Lucknow. One cane was brought over from Lucknow by Mr. W. Lambert, of the Allahabad Sudder Court, and a beautiful specimen it was.

Here is a fine field for the cultivation of the cane all through the Dooab, where we are now travelling. The poor wretched canes that the ryuts are now expressing and manufacturing every morning as we pass along on the march, yields but little juice and that is spoiled by their mode of manufacture.

Garden seeds are very much in request every where up here,

the only good vegetables we meet with are potatoes; they are very abundant at Kunouge and Futtyghur. The cultivation of them is very extensive, and the price they can be procured for, is the surest proof that they are now becoming an article of universal consumption amongst the poorer natives at Kunouge. The cultivators assured me they were glad to get 8 annas a maund for them. At Futtyghur they are somewhat dearer from the large European population of the place.

When you write, I wish you would say, whether I can get any of the Europe fruit trees sent up to the Botanical Garden at Saharunpore. I want, if possible, to take them up to Simla, where I believe they will thrive as well as they do in England.

Believe me,

Very truly yours,

W. DUNLOP.

Extract of a letter from Lieut. W. STEWART *to Lieut. Colonel* DUNLOP, *on the subject of Cotton Seed.*

Chunar, 13th December, 1836.

I duly received your letter of the 7th ultimo from Allahabad; and about a fortnight after, five bags of American cotton seed of the three descriptions you mentioned, despatched by Capt. Watt to my address, came safely to hand. I write these few lines not only to acknowledge the receipt of the seed, but also to assure you that the commission has not fallen into unworthy hands, and that the fullest justice will be done to the Society's intentions in distributing the article. I am far from being a disinterested spectator of the philanthropic exertions of your Society to induce the natives of the country to establish an improved system of agriculture, and look upon it as the sacred duty of every one who has means and power at his command to second their attempts by every exertion he can make. I am going down towards the Soane on an excursion during next month, where a considerable quantity of cotton is grown; and intend to take a bullock load of the seed with me, which I will distribute in all directions to the cultivators themselves, making them all

enter into an agreement to cultivate. If one half of them do so, it will answer all purposes. I am writing to all my indigo planter friends in the neighbourhood, offering each and all of them supplies on the same terms, so there will be no difficulty experienced in getting rid of it to advantage. I have already tried the American tobacco seeds here, and have induced several natives to cultivate it this year.

The quantity of tobacco depends so very much on the soil in which it is grown, that it is quite impossible as yet to say whether or not it will succeed. If it does, it will be very profitable, from the prodigious size of the leaf compared with country tobacco. What I have had prepared, I think very fine indeed in flavour, but also strong for most tastes. I think if kept for a year and then remixed with fresh ingredients it will prove excellent. I will keep some for your pipe the next time you pass this way, or sooner, if I have an opportunity of sending it.

I have only further to add, that if my humble co-operation can be of any use to the Society in forwarding their views in this part of the world, I will ever be at their disposal or yours for the purposes required.

Abstract of the distribution of the Second Indent of American Cotton Seed, consisting of

Upland Georgia, 87 *Bushels,* = 29 *Maunds.*
New Orleans, 78 *do.* = 21½ *do.*
Sea Island, 30 *do.* = 7½ *do.*

Received from J. Richards, *Esq. through Messrs. Baring, Brothers and Co. of London, per Bland, from Liverpool.—(Vide Proceedings of December,*1836.*)*

Date. 1836.		Names.	Upland Georgia.		New Orleans.		Sea Island.	
			Mds.	*Seers.*	*Mds.*	*Seers.*	*Mds.*	*Seers.*
Dec.	13	Capt. A. Watt, Allahabad, for distribution in the upper Provinces......	6	,,	6	,,	1	10
,,	16	The Agr. Society of Singapore.	3	,,	1	20	1	10
,,	20	The Agr. Society of Bombay...........................	3	,,	1	15	,,	30
1837.								
Jan.	6	Wm. Blundell, Esq. Moulmein	3	,,	1	20	,,	30
,,	7	Dr. Helfer for the Tenasserim Provinces............	2	,,	2	,,	,,	25
,,	16	George Leyburne, Esq. Shahabad........................	,,	20	,,	10	,,	20
,,	25	Hon. Mr. Melville for the Experimental Garden at Berhampore.	,,	25	,,	30	,,	25
,,	27	The Agr. Society of Madras	6	,,	4	35	,,	30
,,	,,	The Agr. Society of Bangalore........................	4	20	2	20	,,	30
,,	28	C. De Verinne, Esq. Kishnaghur	,,	,,	,,	30	,,	10
Feb.	3	Rev. G. Hough	,,	10	,,	,,	,,	,,
		In store,	,,	5	,,	,,	,,	,,
		Total	29	,,	21	20	7	20

VIII.—*Specimens of Soils from the district of Ambala, forwarded for analysis.*

[Read 8th February, 1837.]

To JOHN BELL, Esq.

Secretary to the Agricultural and Horticultural Society.

MY DEAR SIR,

Having been much impressed with the truth of some remarks made by Mr. PIDDINGTON, on the propriety of ascertaining the nature of soils previous to attempting to introduce any new species or sort of culture, I take the liberty of sending to you specimens of several soils in this district, in the hopes that you will have the kindness to have them analysed and communicate the result to me.

1. From Ambala, the best soil here in which sugar-cane and all the common crops are grown.

2. Is a specimen of earths procured in sinking a well; it contains quantities of shells and vegetable matter, and I send it with the view of enquiring whether it would be useful as manure to the surface soil which in that place is extremely sandy.

3. From Moonda, produces a double crop annually of rice succeeded by gram.

4. From Moonda, produces very fine sugar-cane and wheat, but very poor cotton.

5. The best from Balawali, produces very fine gram and juara.

6. From Bussian, fine crops of wheat and gram.

7. Sungroor, when irrigated produces fine wheat—sugar-cane not cultivated.

I am particularly curious to know the result of the analysis of No. 5, for the heaviness of the crops produced in a soil which looks like pure sand, where there is no water (that in wells being 150 to 200 feet below the surface), and where it but seldom rains during the cold season, must astonish every one who sees them, and the general vegetation of the country there, is totally dissimilar to what is found in this part of the country.

I have sent the specimens by dawk banghy to Allahabad, whence they will be forwarded to you by steam.

Yours sincerely,

M. P. EDGEWORTH.

Ambala, December 5th, 1836.

Mem.—These specimens have been forwarded to Professor O'Shaughnessy for analysis.—*Ed.*

IX.—*On the culture of Strawberries.*

Extract of a letter from R. LOWTHER, *Esq. to the Secretary, dated Allahabad, 7th February,* 1837.

[Read 13th February, 1837.]

"The season has been unusually mild; as a proof of it, I may mention that we had fine ripe strawberries on the 30th of last month, and two more last Sunday. I have a bigah of plants full blossom. I plant in trenches, which in my opinion is a great improvement, and by far the best mode of preserving them from the injurious effects of heavy rain. Both the flower and fruit are deteriorated when planted in a flat bed, from the overflow of water during the irrigating season; whereas by planting on trenches the roots benefit from the water to the full extent. The fruit does not prematurely decay, and is of a finer colour. From a small beginning last year, I had a cart load of surplus plants for distribution. I manure with pig's dung; it however attracts the white ants. The best remedy is a solution of assafœtida poured over the roots."

X.—*On acclimated Upland Georgia Cotton.*

[Read 8th March, 1837.]

MY DEAR SIR,

I had intended doing myself the pleasure of calling on you to have gathered a little of your knowledge respecting the culti-

vation of cotton from foreign seed and the changes it underwent, before venturing to express my own ideas on the sample you sent me of Colonel COLVIN's cultivation; not having however found time, I send you a rough scroll of a report, hoping you will be kind enough to make any remarks and corrections you see proper and to return it to me also with any additional information, which you may have had from Colonel COLVIN; and I shall have much pleasure in sending it to you again on Tuesday.

Yours truly,

6th March, 1837. W. SPEIR.

To W. SPEIR, Esq.

MY DEAR SIR,

I cannot venture to alter your report, as I am perhaps too sanguine, that foreign cotton will *not* degenerate to the level of *indigenous*, if properly looked after. Husbandry is *neglected* in India, and we all know that cotton, sugar, indigo, and every other product must deteriorate, if left to *nature*. Colonel COLVIN informs you that this cotton grew on a sandy soil fit for nothing else. It had not the benefit of his own zealous superintendence, or it would not have been allowed to vegetate in the immediate vicinity of *Native Cotton*, with which in the gathering, it seems to have been mixed. This circumstance, coupled with the neglect observed in cropping the cotton is, in my humble opinion, a strong argument in favour of its *not* degenerating under ordinary care and regard to *soil;* but this is of course a matter of opinion, and time must test the accuracy of our views. At all events it is satisfactory to have so favourable a report from one whose opinion must have much weight, and grounded as that opinion is on the specimen actually before you under all the disadvantages which it has been grown. I think it a valuable document to place before the Society, and for which I am sure they will be much obliged.

It might perhaps be well to accompany your report with your note to me,* and this reply. The results that have come un-

* Which I return for this purpose should you concur.

der my observation having all tended to confirm my opinion that foreign cotton will not degenerate in India, with common attention. I do not like to meddle with, or suggest any alteration in, the report which you have kindly sent for perusal.

Yours truly,

Calcutta, 6*th March*, 1837. JOHN BELL.

MY DEAR SIR,

I was favoured with your note on Monday which I now return, and think it will form a good accompaniment to the report on the acclimated Upland Georgia cotton, (which you have also herewith), and will serve to correct any erroneous impression which my apprehensions as to deterioration might produce; a subject which I could like to see farther investigated.

I am, my dear Sir,

Yours sincerely,

7*th March*, 1837. W. SPEIR.

TO J. BELL, Esq.

Secretary to the Agricultural and Horticultural Society.

MY DEAR SIR,

I have examined the sample which you sent me of acclimated Upland Georgia cotton, cultivated and brought down by Col. COLVIN. I find the greater part to be of considerably longer staple than our best native cotton, but there are also a number of pods of which the staple is very short. On mentioning this to Col. COLVIN, he informed me that the people employed to collect this parcel had gathered along with it the produce of some plants of country cotton, but that a large bale since procured which is unmixed, is now on its way to Calcutta, and will afford a purer specimen of the acclimated Upland Georgia.

Upon the present sample, I shall merely remark that the staple, with the exception above mentioned, is equal to the American in length and also in fineness, but has lost a little in strength:

there is also, even excluding what may be supposed to be the indigenous, a larger proportion of short fibres mixed with the long than exists in the American, and hence there would be more wastage in manufacturing it into twist. The colour is inferior, and has not the healthy bloom of the original. This is partly accounted for by its having been too ripe before it was collected; many pods are altogether spoiled from this cause. Notwithstanding all these disadvantages, it is superior to the cotton of this country and would sell for 30 per cent. higher in the Liverpool market. Col. Colvin states, that it was grown upon a sandy soil in Purnea, which was useless for every other purpose and that the quantity produced is equal to that of the native sorts. This is the fifth year in which the produce has been collected from the plants raised from the original Upland Georgia seed. We have no means of determining in this instance whether the first crop was equal to the American. Any deterioration which may have taken place, is at least not very rapid, since in the present instance, it is after five years, 30 per cent. superior to that of the country, and will, it is to be presumed, maintain its superiority for some years to come. Taking it therefore for granted, that it would ultimately degenerate so as to be only equal in value to indigenous cotton, the additional price obtained before such supposed deterioration took place, would still far more than counterbalance any expence of seed from whatever distance it might be brought. Reckoning the produce of a bigah at three maunds, the present price being Sa. Rs. 13 to 14 per maund; 30 per cent more gives Rs. 11 to 12 additional on the produce of each bigah, so that allowing the principle of deterioration to its fullest extent, there remains an immense advantage from the importation of foreign seed.

There is another consideration which makes it desirable for the interests of India that a longer stapled cotton should be cultivated.

The coarse and short-stapled East India cotton is chiefly mixed up by spinners with the long stapled West India and Egyptian. When the article is very cheap, less of the inferior is used; and hence it is at such times neglected in the market.

This was the case three years ago, previous to the rise in cotton. East India kinds were not only low, *but had fallen below their relative value.* Even now the supply is in excess of the demand, the stock being in October last 48,900 bales, against 20,150 at the same time in 1835, and the value consequently depressed, shewing clearly that India sends to England too large a quantity of this inferior cotton; and that, if by their exertions one-third could be sent of a superior quality, the Society would confer a great boon upon the country. For not only an additional price would be obtained for the finer sorts, but (from the quality being diversified) the inferior ceasing to be in excess, would command a more ready sale, and would always obtain a price commensurate with its relative value.

I remain, my dear Sir,
Yours truly,

Calcutta, 6th March, 1837. W. SPEIR.

[Read 8th March, 1837.]

To John Bell, Esq.
Secretary to the Agricultural and Horticultural Society.

My dear Sir,

I have examined the specimen of cotton sent by you for my opinion.

It is apparently from seed of the Upland Georgia kind. Whether from imported seed or acclimated seed, and if of the latter, in what year of succession, does not appear. I find it inferior to the best and better descriptions of N. American Upland Georgia: it is somewhat shorter and it is weaker in the staple; neither does it possess the brilliancy and richness of colour of a superiorly grown cotton. It is also gathered rather foully, being leafy, &c.

Still I think, notwithstanding these intimations of inferiority, that it is superior to the cottons common to the upper provinces and that it would sell for 20 to 25, more price in England, than they would do.

The important question then arises, as to the degree of its cropping, when compared with the cottons of the country, and on a fair estimate of the comparative expences of the cultivation.

The season may not have been most favourable for its growth in its particular site, or the needful attention may not have been paid to its cultivation: it certainly has not been gathered so carefully as it might be and as is needful.

I am, my dear Sir,
Yours very faithfully,
Calcutta, 8th March, 1837. J. WILLIS.

XI.—*Notes on Flax, communicated by* John Allan, Esq.

[Read 8th March, 1837.]

To J. Bell, Esq.

Secretary to the Agricultural and Horticultural Society.

Sir,

About two years ago my attention was drawn to the article of Flax, as a profitable export from this country, but my enquiries, in the districts in which linseed is grown, have ended by learning that the straw is atmost entirely used as fuel, and the manufacture of flax utterly unknown.

The importation and consumption of flax, in Great Britain, amounts to many thousands of tons annually; and it is well deserving the attention of the people of India. In the absence of suitable machinery, or indeed of much information regarding its preparation, perhaps the following extract of a letter from a gentleman at Dundee, may be useful to those who have considered the article worth their attention; and I fain hope, induce others to apply themselves to its production.

"Where it is grown in a large scale, there are mills for clean-"ing flax, but in the Highlands of Scotland where each family "grows a little for itself, the process and implements for clean-"ing it, are as simple as possible. Before it is quite ripe it is

"pulled and the bolls with the seed ript off; it is then laid on "straight handfulls, but so as to lay, in the same state, to be lifted "exactly in the same state, in a hole or pit, dug beside a small "stream, and stones laid on it, to keep it down. The water is "then turned on to keep it covered, and just as much allowed "constantly to run on, that there is a drain from it, that it is "not absolutely stagnant, but nearly so. Much depends on the "state of the weather, but at the end of a very few days, it is "quite putrid and the seed, easily broken, and separated from "the flax: it is then spread out straight in a field for some days "to dry. It is then taken up in handfulls and beaten, and then "one end of the flax, is held by hand, so that the rest, hangs "over a piece of wood, and it is beaten downwards along the fibre "with a thin piece of hard wood, like a sabre, and the seedy part "knocked of; and when the one end of the flax is beaten clean, "the other end goes through the same process. Where labour "is cheap the same might be done and simple implements made "for the purpose."

I hope to be able to give you further details regarding this article; and requesting, that these few remarks may be recorded among the proceedings of your excellent and useful Society.

I remain,

SIR,

Your faithful servant,

JOHN ALLAN.

XII.—*Suggestions on Sheep and Wool.*

Extract of a private letter to the Secretary, dated Jan. 15, 1837.

"I have no doubt but a settlement of sheep might be formed in the Himalaya Hills on the Southern slope of the passes leading into Kanower. The rains which are supposed to militate against sheep are not of similar violence or continuation as those in the plains of Hindoosthan; and as for pasture, I think from what I have seen and read, that multitudes might find ample and appropriate food.

"In the winter, when the snows are thick, the sheep could descend into the vallies, where shelter and dry food would be prepared. I am not aware that any particular disease or obstacle to an increase is likely to exist; of ravenous animals there are few, or none, but bears. Eagles however would prove dangerous, without sufficient protection to the young lambs."

"The Hill sheep is a strong robust animal, and such as nature made him; nothing has been done, I imagine, to improve the fleece, which is a strong and substantial substance, and of which I believe the coating of the Mountaineer is made.

"I should be glad to learn if the Government would be likely to afford assistance to an individual, who entertained the project of introducing a better sort of sheep in the Hills, promising such benefit to the country. You are aware that though the British Authority is paramount in the Hills, it has not actually territorial possessions where I should suppose the preferable position for sheep. My idea is, that the southern face of the Himalaya, from the Sutlege, at the *Borendo Gunnoss*, and other passes, at an elevation of from 11 to 13,000 feet would be the spots best adapted; and if I remember right, there is no timber save birch and juniper in the narrow valleys where water runs, but the face of the country generally is undulating knolls, covered with wild strawberry plants to the knees. There is of course other pasturage underneath; in parts the grass is of a short herbaceous kind, resembling that upon our downs in England.

XIII.—*On the value of Cotton seed for oil.*

[Read 12th April, 1837.]

To JOHN BELL, Esq.

Secretary to the Agricultural and Horticultural Society.

MY DEAR SIR,

As the present Secretary of our Society, I have much pleasure in handing you the inclosed extract of a letter we have

just received from our correspondent Mr. A. H. Palmer, of New York, the information it contains on the use now made of cotton seeds in the States, and also the circumstance of the enterprizing Pasha of Egypt having taken measures for turning them to the same profitable account there, will no doubt be interesting in a country like this, when with such an abundance of the material at hand it seems only to require a little of the same enterprize to insure similarly advantageous results and to add one more to the many new exports from Calcutta which the last few years have called forth.

Yours sincerely,
Calcutta, 30*th March*, 1837. CHARLES LYALL.

Extract of a letter, dated New York, October 27*th*, 1836, *from Mr*. A. H. Palmer, *to Messrs*. Lyall, Matheson *and* Co.

"Presuming it may interest the agricultural interests of Ben-"gal, I deem it proper to mention, that within a few days past, "we have received orders at this agency, from His Highness, "the Pasha of Egypt, for all the necessary machinery, &c. for a "steam rice mill, for husking and cleaning rice, on an extensive "scale, by the improved process employed in this city and in South "Carolina and Georgia: also for a cotton seed oil mill, to be "worked by steam power, according to the patent process exten-"sively used in this country, where the oil is now manufactur-"ed in large quantities, and sells for about one dollar per gallon. "It burns equal to the best spermacete, and is successfully used "as a substitute for almost every other kind of oil. One bushel of "seed yields about 2 quarts of oil, the outer rind or pelicle of the "seed, supplies the only fuel used in working the steam engine; "all the machinery and apparatus for an establishment capable "of manufacturing about 300 gallons of oil per day, will cost "about 15,000 dollars delivered on board in this port. You "would much oblige me by communicating these particulars "to Mr. Piddington, the Secretary of your Horticultural "Society."

XIV.—*Report upon Specimens of Cotton grown at Singapore.*

[Read 12th April, 1837.]

To JOHN BELL, Esq.

Secretary to the Agricultural and Horticultural Society.

DEAR SIR,

You requested me some days ago to examine and report on some specimens of Mr. CRANE's cotton, grown at Singapore, and transmitted to you by him in the month of February last.

One of them is said to be from the Pernambuco description of seed, and I find it bears the character of that kind of cotton.

It is decidedly of most inferior quality, being coarse, harsh, short in staple, and very weak. The machine spinner would prefer an indigenous Bengal cotton, if a good fair quality, at a cost of 5*d.* per lb.

The other specimen is said to be from Bourbon seed, and it is a good fair sample of this description.

It is fine and silky, of good fair length in the fibre, and of pretty good strength of staple, yet not quite so strong as it ought to be; its complexion is good also.

On comparing it from remembrance with some specimens of the same kind of cotton now being grown in the Madras Presidency, I think it of nearly equivalent value. This cotton would now from the latest received intelligence from Liverpool, be valued there at about 9*d.* per lb.; the Madras grown Bourbon, bearing at the same time about 10*d.* per lb.

The specimen of the same kind of cotton, with its seed attached, which you also gave to me, seems to shew a tolerably plentiful quantity of wool to be on the seed; its strength is somewhat impaired by not having been detached from the seed. The seed itself is small, rather smaller indeed, than some of the same kind which I have sometimes seen, but I know not that, on this account, it can, as an invariable rule, be held to have become degenerate, or that the produce in wool shall *necessarily* be so.

How is it that we sometimes find in edible and other fruits improvement in either the flavour or the volume of pulpy and fibrous matter, when the seed itself becomes much diminished under improved cultivation?

In examining these two specimens of cotton wool said to be both grown at Singapore, I have been struck with the very great deterioration of the one kind, when compared with the fairly and well upheld quality of the other.

I return the specimens,

And am, dear Sir,

Yours very faithfully,

Calcutta, 11th April, 1837. JOSEPH WILLIS.

XV.—*Notes on the Nurma Cotton. By* J. W. GRANT, *Esq.*

[Read 12th April, 1837.]

MY DEAR SIR,

You may recollect my mentioning the Nurma cotton one day at the Garden. I have the pleasure of sending you a specimen. Mr. BRUCE tells me it is the same as the Upland Georgia, and has been long grown in Malwa.

Yours sincerely,

Tuesday. J. W. GRANT.

MY DEAR SIR,

I must rectify a mistake I have led you into. The Nurma, I should have said resembles the Sea Island, not the Upland Georgia, but Mr. BRUCE thinks it must be distinct, since it has been grown in Malwa from time immemorial; this by no means follows, however.

Yours sincerely,

28th March, 1837. J. W. GRANT.

XVI.—*Extract of a letter from* D. MACLEOD, *Esq. of Seonee, to the Secretary, dated 9th February,* 1837, *seeking information regarding the Wild Silk Worm.*

[Read 8th March, 1837.]

As I perceive the subject of Tussur silk is beginning now to attract the attention it merits, I trust I may hope through your transactions or otherwise, to attain ere long, such information on the subject, as may enable us to improve the application of the article in these parts; the principal cause of its deterioration appearing to me to be, the extremely defective method of winding employed by the weavers. A gentleman of the name of MOSSE being about to settle himself here, with the view of turning his attention to such branches of commerce and manufacture as many prove most profitable, the subject is likely to prove of great importance to him.

On the habits of and mode of rearing the Wild Silk Worm. By Mr. HOMFRAY.

To JOHN BELL, Esq.

Secretary to the Agricultural and Horticultural Society.

DEAR SIR,

If the accompanying piece of information regarding the Wild Silk Worm, or Tussuk poka, is of any interest, it is at your service.

The cocoons of the wild silk worm which are found on the wild plum tree are collected for breeding from; they are placed in a basket made of close wove bamboo work; and in a short time the moth makes its appearance by bursting through its cone, which it effects by moistening the end of it at which its head is situated. The males which are distinguishable, are then separated from the females, after a sufficient time has elapsed for her eggs to become impregnated, which requires a very few days, when several of them are again confined in close wove bamboo baskets, about a foot square and as much in depth, a few days

pass before they lay a number of small eggs of a reddish colour, and in number about one hundred and fifty, after which the females die or are let loose. The eggs are hatched in the basket in which they are laid, and in the period of nine or fourteen days, being the less time in the rainy months. When the worms are hatched, they are provided during the first day with the leaves of the khowra tree or plum tree, and on the second of their existence, small branches of the same are introduced into the basket on which they eagerly fix themselves, and are then removed to their final station on the khowra trees, when they roam about at full liberty, satisfying their voracious appetite till they become three or four inches in length and of a brilliant green colour, marked with golden spots; here they lay upon the leaves of the trees their cones, which, contrasted with the deep colour of the leaves, has a pretty appearance; it usually occupies fifty days between the time of loosing the worms on the trees and the gathering of the bund. The quantity of cocoons gathered varies a great deal, being influenced by the weather, the quantity of food, high winds which blow them off the trees, and care taken to preserve them from the insults of birds. Fifty or sixty cocoons from each breeder will be about the average quantity produced; they are sold by the rearers to weavers at the rate of 3, 4, and 5 Rs. per kan, or 1280. If of a good quality, four pun, which is a quarter of a kan, are sufficient to manufacture a pair of dhooties, which sell for 4 and 5 Rs. The khowra tree is found in quantities throughout the Sunderbunds, and when uninterrupted, grows to a tolerable bulk and great height. The planks, which resemble those of mangoe wood, are freely used for all common purposes. The site, however, selected for rearing the wild silk worm is on the extreme edges of the jungle, where a party of the rearers establish themselves for the necessary time in a few gipsey sheds, protecting their position by little stages erected high from the ground in different directions, and on which one of the party patiently takes his station with a bow and pellets to drive away the birds which are always on the look out for this dainty food, while others of the party are occupied below in tending on the worms; they soon

eat down a large tract of jungle in distributing the insects from tree to tree. A trifling rent of about one rupee per party of four men, of which number they on an average consist, is paid to the Zemindar of the place. The result of their labour for upwards of two months is very precarious, sometimes yielding thirty rupees, and at others barely ten; during this time they are oblig-ed to submit to many restraints which an ignorant superstition has imposed on them, such as abstaining from eating fish, anoint-ing their bodies with oil, which to natives are severe depriva-tions, and mentioning the names of certain things which are considered unclean.

I do not consider that the European can enter into this trade, the results of which are precarious, and carried on in the most unhealthy situations; and as the quantity made is limited, the whole is used in the country in the manufacture of dhooties and sarries, which is considered a luxurious refinement in the dress of a native. The large quantities in the Bhaugulpore district are wove into coarse piece goods, known under the name of Tussah, and now much used in Calcutta.

I remain,
My dear Sir,
Yours sincerely,

Barripore, 6th March, 1836. R. HOMFRAY.

XVII.—*Caoutchouc.*

Papers relating to the formation of a Caoutchouc Company in England, and the probable source of wealth which may be de-rived from this product in India.

[Read 10th May, 1837.]

To John Bell, Esq.
Secretary to the Agricultural and Horticultural Society.

My dear Bell,

I received on the 19th ultimo a letter from Professor Royle,

dated London, the 8th December, of which I hasten to give you an extract, relating to Caoutchouc. A parcel accompanied it containing one flask of Caoutchouc, a wooden form as a model of the shape in which the substance is required to be formed, and an open letter seemingly from the Secretary of the London Caoutchouc Company, without date, address or signature; also a number of prospectuses of the said Company to which I have added several which Professor ROYLE intended for me, making altogether eight copies.

All the above-mentioned articles I have the pleasure to send you herewith, requesting that you will lay them, together with the following extract, before the Agricultural Society's meeting next week.

Extract.

"I write also now to beg your assistance in bringing before the Agricultural Society a new source of wealth, that is Caoutchouc, which is now imported in such vast quantities from South America, as well as the East India Islands. ROXBURGH's account of Ficus Indica shows its Caoutchouc to be of excellent quality. SHEDDEN tells me it is abundant on the Assam frontier, as you must well know. He sent some down with the tea in 1825 to Calcutta, by desire of SCOTT; and THACKER tells me that the last year he was in Calcutta, a native brought some for sale to Calcutta, but it was undried, in bamboo *bottles.* I will send you a paper I am writing soon, as well as the resolve of the Company to give a reward of £50 or £100 to the first person who sends it home of good quality. We are going to address the Company to direct their officers in that direction to facilitate the collection of this, which promises to become a large source of revenue. The Company will use not less than 200,000 lbs. annually of Caoutchouc, and now almost the whole quantity comes from South America and the Indian Islands, a portion lately from Sierra Leone; they offer to send any quantity, but it is not so elastic as either the South American or Indian. The latter is preferred for its comparative want of smell. SIEVIER sends me directions about the form in which it should be collected, that of cy-

linders is preferred. Caoutchouc is coming into immense consumption; a new application turns up almost every day."

"I think if you were to bring it before the Agricultural Society, some young men might be induced to visit the Caoutchouc country with a small gang of coolies, who might be taught, and would teach the natives, how to collect it to the best advantage; and perhaps, might, instead of useless Neem Trees be induced to plant the noble laurel-looking, milk-secreting, fortune-making Ficus elastica. ROXBURGH's and HARRISON's papers in the fifth volume of the Asiatic Researches have astonished some of the people here, as some of what have been considered discoveries were discovered in India many years ago. I will, as soon as possible, send you the paper issued by the Company, with the scale of reward. Mr. RAVENSHAW is a shareholder with a great many other Indians. Would not Mr. PIDDINGTON be an excellent man to induce some aspiring *youth* to visit *Durring* between the Burampooter and the Bootan Hills. But you know the most accessible parts; your collectors might collect the Caoutchouc in addition to their other labour. Excuse haste."

I repeat with my friend ROYLE, excuse his haste, for in one or two places I have scarcely been able to decypher his handwriting.

I take this opportunity to state, that there is a large climbing shrub in this garden, a native of the Peninsula, which ROXBURGH calls *Nerium grandiflorum*, and which has, of late years, been made into a new genus (Cryptostegia) by Dr. BROWN. It abounds in Caoutchouc, I think superior in whiteness and elasticity to that of the Fica elastica. I furnished a sample to Mr. PRINSEP last year. I believe he sent it home for a trial. I will have more prepared this season.

Yours truly,
N. WALLICH.

London Caoutchouc Company.

SIR,

I have the pleasure of sending,* by direction of Professor ROYLE, some samples of India Rubber of the quality and thick-

* Only one sample accompanied this letter.—N. W.

ness that is most desirable for the uses it is put to in this country for elastic materials, many thousand tons of which are required annually.

The natives of Para, from whence the accompanying sample comes, make a clay shape of the form of the bottle, and when that clay mould is dry, it is dipped in the juice which exudes from the tree, and that is repeated until after each successive layer, (which is dried previous to another being laid on), gives it the thickness desired. There are from 30 to 50 layers upon each bottle; by pressure the clay mould is then broken and got out at the neck. To obviate the making of these moulds, as well as to get a better shaped piece of India rubber for manufacturing purposes, I have sent the accompanying wood mould, which should first be dipped into clay water, so as to leave a thickness of clay when dry of about $\frac{1}{16}$ of an inch, to prevent the India rubber from sticking. They must be then dipped into the solution, and coating after coating dried, until it become of the required thickness (about half an inch.) It will be then removed from the mould and the same process again repeated. The mould should not be dipped higher up than the line made upon it.

Great care must be taken, that the layers are put on so as to form one solid mass, and not to separate. The bottles or pieces so formed should have as smooth exteriors as possible, viz. not marked with spots or devices.

The "London Caoutchouc Company" offer a reward of £50 for the best samples of not less than 112lbs. weight, that may be sent with proper certificates that it was gathered from our East India possessions.

I am, your most obedient servant.

The samples must be directed to "The Secretary of the London Caoutchouc Company," (London.) The eyes at the top of wood mould are to hang them up to dry.

Asiatic Society of Bengal.

To JOHN BELL Esq.

Secretary to the Agricultural and Horticultural Society.

SIR,

I am directed by the Asiatic Society to offer to your Society a copy of a prospectus of the Caoutchouc Company lately established in London, together with a note received through professor ROYLE of the best mode of collecting the Caoutchouc for transmission home as a commercial product.*

The immense consumption of this article at present offers an opening for its extensive cultivation in Silhet and Assam with advantage, and it is with this view that the Asiatic Society deem the subject well worthy of the attention and encouragement of the Agricultural Association.

I have further the pleasure to hand you the model of the block upon which it is suggested that the gum should be collected, in lieu of the earthen balls hitherto employed in South America.

I have the honour to be,

Sir,

Your most obedient servant,

J. PRINSEP,

Secretary, Asiatic Society.

4th May, 1837.

LONDON CAOUTCHOUC COMPANY.

To be incorporated by Act of Parliament. Capital £200,000, *in* 8000 *Shares, of* £25 *each.*

TRUSTEES.

Charles Enderby, Esq. - James Harwick Oughton, Esq.
William Leaf, Esq. and
J. L. Heathorn, Esq. Colonel Henry A. Purchas.

* Vide preceding circular.

DIRECTORS.

Capt. Evans, R. N.	Thomas Gaspey, Esq.
Wm. Brockedon, Esq. F. R. S.	Thomas Cornish, Esq.
R. P. Staples, Esq.	R. W. S. Willsonne, Esq.
John Wardell, Esq.	Capt. G. Probyn, E. I. C. S.

BOTANICAL ADVISER.—J. Forbes Royle, Esq. F. L. S. late Superintendant of the Hon. East India Company's Botanical Establishment in Northern India.

MANAGER.

R. W. Sievier, Esq.

AUDITORS.

George Augustus Brown, Esq. John Sewell, Esq. Frederick S. Dixon, Esq.

SOLICITOR.

Thomas Wight, Esq. 25, Percy Street, Bedford Square.

BANKERS.

The London and Westminster Bank.

SECRETARY.

Mr. H. S. Evans.

COMPANY'S TEMPORARY OFFICES.

King William Street, City.

The last few years have witnessed the introduction of CAOUTCHOUC, or INDIA RUBBER, into this country in considerable quantities, and its application to a variety of useful purposes. The attention of the public has been particularly directed towards this extraordinary production: every day brings forward new adaptations of its peculiarities, and from all of them great benefit has resulted to the projectors and to the public. The extent indeed to which India Rubber may be used can scarcely be calculated, but the careless manner in which it is collected, and brought to England, and the narrow channel through which it has hitherto been allowed to reach the manufacturer and consumer, seriously impede all operations in favour of its more extended and general use. The fact of the vast abundance in which India Rubber is found in different parts of Asia and America, the trifling cost and labour required in its collection, and the numerous new and important purposes to which it is applicable,

have led to the formation of the "LONDON CAOUTCHOUC COMPANY," the operations of which, from the means it will possess of widely extending the use of this valuable gum, cannot fail to prove exceedingly profitable to the Shareholder, and at the same time highly beneficial to the public.

The objects of the Company are—

To introduce into the English market a proper supply of the best India Rubber to meet the constantly increasing demand.

To apply India Rubber in the manufacture of the various articles in which *elasticity* may be found to be useful; also in *rendering cloths* and other fabrics *waterproof*, and in preparing solutions of India Rubber for varnishes of all descriptions.

In furtherance of the first of these objects, the Directors have given their attention to the sources from which the present supply of India Rubber reaches this country, and they find that the larger importations are from Portuguese America, but that an abundant quantity, more than equal to any possible demand, may be obtained from our East Indian settlements. Great and valuable assistance has been afforded to the Directors by the energetic co-operation in the objects of the Company by several influential gentlemen connected with the *Royal Asiatic Society*, and the *Agricultural Society of Calcutta*, (particularly by Professor Royle, late Superintendant of the *Hon. East India Company's* Botanical Establishment in Northern India, who has offered his valuable services to the Company as Botanical Adviser,) through whom a connection has been actually opened with India for the importation direct to the Company, of the Asiatic, especially the East Indian, varieties of the gum.

Towards carrying into effect the second object of the Company, viz. the application of India Rubber to manufactures where elasticity is required, the Directors have agreed for the purchase as soon as possible of the exclusive right of working the valuable Patent obtained by Mr. Sievier, for the manufacture of Elastic Ropes, Cables, Bands for driving Machinery, &c. &c. It is unnecessary to offer any observation on the value of the elastic principle in these articles; in all of them it has been found to be eminently useful, as is vouched by the concur-

ring testimony of great numbers of scientific and practical persons, and by the constantly increasing demand for them ; a demand which requires the extensive means and ENERGIES OF A COMPANY to keep pace with. With this exclusive PRIVILEGE, the Directors have secured the assistance of Mr. SIEVIER, the patentee himself, whose extensive acquaintance with India Rubber in all its applications will prove highly beneficial to the Company. The working of this Patent alone cannot fail to produce a very considerable return for any capital employed therein. Purchases have been made on advantageous terms by the Directors of Premises and Machinery ACTUALLY EMPLOYED in manufacturing articles where India Rubber is used, the Proprietors of which have joined the company as Shareholders, and are prepared to bring all their EXPERIENCE to the assistance of the Association. The company is thus in a situation to come into IMMEDIATE PROFITABLE OPERATION, and is prepared at once to SUPPLY from their WORKS, to any EXTENT, the following articles : viz.

ELASTIC Cables,
——— Whale Fishing Lines,
——— Gun Breechings,
——— Artillery Traces,
——— Sash Lines,
——— Well Ropes,
——— Ropes and Bands for Coal and other Mines,
——— Towing Ropes,
——— Bands of all sizes, whether flat or round, for driving Machinery, &c. &c.

ELASTIC WEB for Braces,
——————— Garters,
——————— Surgical Bandages,
——————— Belts,
——————— Horse Rollers,
——————— Saddle Girths,
——————— Ladies' Stays,
——————— Laced Stockings,
——————— Ladies' Boots,
——————— Waist Bands, &c. &c.

India Rubber VARNISHES of all descriptions for water-proofing Cloth, Leather, Canvas, Military Tents, &c. &c.
———— for Blacking,
———— Paint,
———— Ditto for Park Paling, and outside work.

Stationers' Sheet and Block Rubber.

Elastic Tubings, and all other Articles for Surgical purposes, &c. &c.

AND EVERY OTHER ARTICLE TO WHICH CAOUTCHOUC IS APPLICABLE.

The prospects of the Company when in full work appear to the Directors to warrant the expectation that the ANNUAL DIVIDEND to the Shareholders will be exceedingly large. From the extent of the premises and STEAM POWER of the COMPANY AT EACH OF THEIR MILLS, NOW IN FULL OPERATION, they are in a situation to UNDERTAKE AND EXECUTE CONTRACTS TO ANY EXTENT. They are also prepared to work on COMMISSION FOR PATENTEES ANY PATENT for the *use* and *application* of INDIA RUBBER.

The capital of the Company is nominally £200,000; but it is expected that one half of this sum will be sufficient to carry into effect the objects of the Association; a deposit of £2 10*s.* per Share is to be paid as the first instalment, within seven days after the appropriation of the Shares; and further instalments of £2 10*s.* per Share will be called by the Directors as they shall find necessary, at intervals of not less than one month, of which 21 days' notice will be given; but the amount of Capital to be *thus* called up shall not exceed in the aggregate £12 10*s.* on each Share without the sanction of a General Meeting of the Shareholders, specially called for the purpose. All Shares on which the instalments called are not duly paid, shall be liable to to be forfeited to the Company at the discretion of the Directors.

The management of the Company shall be entrusted to six Directors, with power to add two to their number, each Director to possess in his own right at least 30 Shares. It is to be un-

derstood that the Directors will have no claim for remuneration for their services in that capacity until an annual dividend of at least 5 per cent. has been paid to the Shareholders, and the amount then to be paid them to be determined by a General Meeting of the Proprietary.

At all General Meetings, except as hereinafter named, a majority of votes shall decide any question submitted, and such decision shall govern the proceedings of the Directors in conducting the business of the Company—at General Meetings, holders of 5 Shares to have 1 vote, of 10 Shares 2 votes, of 20 Shares 3 votes, of 30 Shares 4 votes, and 40 and upwards 5 votes. Holders of Shares may vote by proxy; proxies to be held by Shareholders only, and to be registered at the Office of the Company seven days before the Meeting, at which they are to be used, takes place. Upon any question submitted to a General Meeting, a Ballot may be demanded by any Proprietor, such Ballot to take place at a Meeting to be held fourteen days after the Meeting at which it was demanded; notice of the Meeting to be given once in the London Gazette and in two of the daily London papers.

At any time the Directors, or any number of Proprietors, not less than 20, Holders in the aggregate of 500 Shares, may convene a Special General Meeting, to consider the propriety of dissolving the Company, and if at such Meeting a majority of two-thirds in amount of the proprietary present shall deem it expedient to dissolve the Company, a second Meeting shall be held to confirm or negative such decision; and if at such second Meeting there be present in person, or by proxy, one-half of the whole proprietary of the Association, and three-fourths of the Meeting shall determine on dissolving the Company, the business shall cease to be carried on, and the Assets and Stock sold and divided amongst the Shareholders in their proper proportion.

All Special General Meetings of the Proprietors shall be summoned by the Directors by public advertisement fourteen days before the Meeting in the London Gazette, and in two of the daily London papers, and a letter announcing the Meeting

shall be sent by post to each shareholder at his residence, as recorded in the books of the Company.

The first General Meeting of the Shareholders shall be held in the first week of July, 1837, to receive a statement of the affairs of the Company; and regular Meetings for the same purpose, and for declaring Dividends, shall take place every succeeding six months, notice of such meetings to be given by advertisement once in two of the daily London papers fourteen days before the Meeting.

Two of the Directors will vacate office annually by rotation, but will be eligible for re-election; the expiration of the first year to date in July, 1838; vacancies occurring in the Direction previous to July, 1838, to be filled up by the remaining Directors.

The Auditors of the Company shall be three in number, who must hold in their own right 20 Shares each: one of them will vacate office annually, but will be eligible for re-election.

The Directors will, as early as possible, apply for a Charter or Act of Incorporation, so as to limit the liability of the Shareholders to the amount of their respective Subscriptions; meanwhile a Deed will be prepared, in which provision will be made that in all contracts or engagements on behalf of the Association, Shareholders shall not be subject, or liable, beyond the unpaid amount of their Share or Shares. A clause will also be introduced enabling any number of Shareholders, not less than 20, and holding 500 Shares, to require the Directors to call a General Meeting to take into consideration and decide on any matter connected with the interests of the Company, such Meetings to be considered as Special. The Requisition to the Directors to call the Meeting must be lodged at the Office of the Company, and must state the subject matter intended by the Requisitionists to be submitted to the Meeting, to which the business shall be strictly confined. The Directors shall, within seven days after the receipt of the Requisition, convene the Meeting in the manner prescribed for Special Meetings.

All instalments on Shares are required to be paid to the Ac-

count of the Company into the LONDON and WESTMINSTER BANK, at either of their Establishments, viz.

No. 38, Throgmorton Street.
— 9, Waterloo Place.
— 155, Oxford Street.
— 213, High Holborn.

Applications for Shares to be addressed to THOMAS WIGHT, *the Solicitor to the Company,* 25, PERCY STREET, BEDFORD SQUARE,

Or to the Secretary, MR. EVANS, *at the Company's temporary Offices,* KING WILLIAM STREET, *opposite Nicholas Lane, where SAMPLES of the various Articles manufactured by the Company may be seen.*

Form of application for Shares.

TO THE DIRECTORS OF THE "LONDON CAOUTCHOUC COMPANY."

Gentlemen,

I request that you will appropriate to me Shares in the "LONDON CAOUTCHOUC COMPANY," *and I agree to take such Shares as shall be allotted to me, to pay the Deposit thereon, as and when I shall receive notice so to do.*

Name.

Dated 1836. *Residence.*

XVIII.—*On Pruning Peach Trees. By* MR. J. W. MASTERS.

[Read 10th May, 1837.]

TO JOHN BELL, Esq.

Secretary to the Agricultural and Horticultural Society.

DEAR SIR,

The paper containing "Observations on Pruning," which I forwarded to the Secretary for Mr. PIDDINGTON in 1835, I have again received, and have now the pleasure of submitting to the Committee of Papers, that part of it which refers to the peach tree. The method therein recommended was adopted in the

Botanic Garden more than two years ago, and the Superintendent has been pleased to express himself satisfied with the result. Should the Committee think that such short communications are likely to promote the objects of the Society, I shall have much pleasure in sending from time to time such information as I may be enabled to collect.

Yours truly,
J. W. MASTERS.

Botanic Garden, 1st May, 1837.

On Pruning the Peach Tree.

In the first season after planting out a young peach tree where it is intended that it should remain, if it be a strong healthy plant, rub off all the buds that are within eighteen inches of the ground; and just before the remaining buds begin to break, (which they will do about the beginning of January,) shorten the leading shoot to five healthy wood buds, cutting close to the fifth bud in a sloping direction upwards. If the plant succeeds, and all the buds are developed, there will then be one perpendicular shoot, and four lateral ones.

The next season, shorten the leading shoot to five, or seven healthy wood buds, according to the strength of the tree, leaving one terminal, and four or six lateral buds. If the tree does well the ensuing season, the head may be said to be formed; consisting of one perpendicular leading shoot, and twenty-four lateral shoots. The next year the same process may be repeated, after which a different method should be adopted.

When the head of the tree is fully formed, and the branches well arranged, endeavour to keep it in the same shape; shorten none of the leading shoots, nor any that are well situated or well furnished with blossom buds, unless they are too long or growing greatly out of bounds, or weak, or unhealthy; in such cases cut them back to a healthy wood bud. As the buds begin to break, and the leaves to expand, rub off all the wood buds that are out of place, such as are likely to send strong shoots into the middle of the tree, interfering with the main branches.

When the young shoots are advanced in growth in the months of March or April, if any of them are found to interfere with more desirable branches, cut them clean out, cutting as close as possible to the branches from which they issue ; frequently look over the trees, between February and June, and protect and encourage all the young wood that is intended to produce fruit the next year, and remove every thing else.

The fourth season after planting, or when the tree has attained to the desired height, in the pruning season shorten none of the branches that are to bear fruit the ensuing season, cut the perpendicular leading shoot to five wood buds; and if the tree is well furnished with lateral branches, and these arranged in a regular manner, cut back every other one of them to seven promising wood buds; this will generally be below all the blossom buds, but the branches so cut down will furnish a good supply of bearing wood for the next season, when those which produced fruit the preceding are to be treated in a similar manner; a continual supply of good bearing wood may thus be obtained.

Trees do not always succeed so well as the owner wishes, nor as here described ; frequently some of the branches are blighted, or diseased, or broken ; if diseased, or blighted, cut them clean out; if broken, cut below the wound, and endeavour to fill up the vacancy by shortening some of the nearest young shoots ; if this be done in March or April, by merely pinching off the leading bud, the gap may be filled up the same season. Keep the tree clean ; let every part of it be well furnished with bearing wood, but with no more than is necessary, let the branches have room to grow without interfering with each other. Never shorten the fruit-bearing branches, unless it can be done to advantage, and then always cut close to a healthy wood bud. The peach tree bears fruit on the young wood that was produced the preceding year, if that be cut off there will be no fruit at all. The wood that is produced in the first part of the season, when there is a good supply of wholesome nourishment, is for the most part healthy, with strong wood, and blossom buds; as the sap becomes exhausted, and the rains set in, the ends of the shoots become weak, producing blossom buds, with only one wood-bud ;

and that at the end of the shoot. If the terminal bud be cut off, the shoot will die down to the next wood bud, often to a distance of twelve or eighteen inches; the intermediate fruit will sometimes swell and even ripen, but is always far inferior in flavour to that which is nourished and protected by leaves, the dead stumps give an unsightly appearance to the tree during the whole season, harbour insects and engender disease; and when cut, or broken off, the wounds do not heal over in a healthy manner.

Strong rampant shoots that are exhausting the nourishment which others require, shorten early in the season to four or five buds, and they will produce good bearing wood to fill up vacancies, if there are any; if there are not, cut the shoot clean out; two or three such rampant shoots, if suffered to remain, are sufficient to spoil the best peach tree in the world; they are frequently caused by one or more of the roots having penetrated into the subsoil. If the tree be young, if not more than two or three years standing, take it up, and spread the roots in an horizontal direction which will cause the nourishment to be supplied to the whole tree in a more regular manner. If the tree be old, or too large to be taken up in this manner, then open the earth about the roots, cut the top-root, and supply manure to the roots that are near the surface, this will encourage them to extend themselves in a horizontal direction. About the beginning of June, or so soon as the fruit is all gathered, go over the trees and take out all superfluous branches, and such as were left in January merely for their fruit; let none remain but those that are intended to produce fruit the next season, or a succession of fruit-bearing wood. Take out all the young side shoots that are produced in the latter part of the season, they are of no use but serve to deprive the rest of nourishment. Never pull off the leaves with an idea of benefiting the fruits; the fruit is not benefited by this practice, but injured by it; if deprived of the nourishment and shelter afforded by the leaves, the fruit becomes hard and ill-flavoured. A well managed tree has not a leaf to spare.

J. W. MASTERS.

Addenda to Mr. Campbell's *Notes on the Agricultural and Rural Economy of the valley of Nepaul.*

At page 129, *after line* 31, *read*

Note 1.—Since writing the text, I have met with a notice of this plant (Phofur) from Royle's Himalayan Botany, in which it is identified with the Buckwheat of Europe. He says, "In the Himalayas Fagopyrum esculentum (Phophra and Kooltoo of the natives) is most commonly cultivated, but Fagopyrum emarginatum (Ogla) which comes very near the Linnean specimens of Fagopyrum tartarerum, is preferred in higher and drier climates as in Kunawur." He further says, that the two first are no doubt originally inhabitants of Central Asia, and that both are much cultivated at present in Russia and Siberia, as well as in Piedmont and on different elevations in the Alps. What I have called 'varieties,' are probably distinct species. The plants are not now procurable to determine the point. But I recollect that the blacker, or bitter tasted Phofur plant has a reddish coloured stalk, and the sweet Phofur a white stalk. Both plants have a white flower.

At page 125, *after line* 23, *read*

Note 2.—The cultivators of the Hills divide the maize into 3 different kinds. A white grained one which is generally grown on the hill sides, a yellow grained one grown in the low and hot valleys, and a smaller one called '*Bhoteah* or *Murilli Makii*', which is considered the sweetest of the three, but from being less productive than the other two, is less generally grown on good lands. Through the kindness of Mr. Bell in furnishing me with seed, I hope to be able to add two kinds of American maize to those now grown.

A. C.

PROCEEDINGS

OF THE

AGRICULTURAL AND HORTICULTURAL SOCIETY

OF INDIA.

Exhibition of Vegetables held at the Town Hall, on Thursday, the 19th January, 1837.

Present.

The Right Honourable GEORGE LORD AUCKLAND, G. C. B. &c. &c. *Patron.*

The Honourable Sir E. Ryan, Kt *President.*

The Honourable Col. Rehling,
H. Walters, Esq.
Wm. Storm, Esq.
J. W. Masters, Esq.
H. M. Parker, Esq.
H. M. Low, Esq.
M. S. Staunton, Esq.
D. Hare, Esq.
C. K. Robison, Esq.
Alex. Beattie, Esq.
R. Walker, Esq.
G. T. F. Speed, Esq.
D. W. H. Speed, Esq.
C. Trebeck, Esq.
Willis Earle, Esq.
Samuel Smith, Esq.
W. H. Hammerton, Esq.
G. U. Adam, Esq.
J. Curtis, Esq.
Dr. A. R. Jackson,
James Crook, Esq.
Dr. Strong,

Captain Leach,
C. De Verinne, Esq.
J. R. Savi, Esq.
J. C. Wilson, Esq.
J. P. Grant, Esq.
W. P. Grant, Esq.
Arch. Grant, Esq.
D. McFarlan, Esq.
W. F. Gibbon, Esq.
J. Cock, Esq.
C. Hutchins, Esq.
Dr. Wallich,
James Pontet, Esq.
J. H. Stocqueler, Esq.
R. J. Bagshaw, Esq.
G. A. Prinsep, Esq.
C. R. Prinsep, Esq.
James Prinsep, Esq.
J. Bell, Esq.

Judges.

Dr. Wallich, and Messrs. Storm, Bell and Masters.

Reg No.	*Names.*	*Situation of Garden.*	*Sample.*	*Medals awarded*	*Donations*
	(A)	CAULIFLOWERS.			Rs.
194	Rajoo Mallee,	Balegachee.	Best	1	8
6	Ramnarain Doss,	Rajkissore,	2d best	,,	5
62	Koochill Doss,		3d best	,,	3
	(B)	PEAS.			
166	Seeboo Doss,	Etal Ghaut.	Best	1	8
157	Muddor,	Mootee Jil.	2d best	,,	5
182	Bissonauth Bhose		3d best	,,	3
	(C)	LETTUCE.			
176	Hullodhur,	Kidderpore.	Best	1	8
156	Ammoor,	Jharoolah.	2d best	,,	5
215	Kodoop Mallee,	Moocheekollah.	3d best	,,	3
	(D)	CELERY.			
33	Ruggonauth,	Dacoore.	Best	1	8
1	Hullodhur Doss,	Moocheekollah.	2d best	,,	5
	(E)	RED BEET.			
134	Mauthoor Ghose.	Moocheekollah,	Best	1	8
	(F)	TURNIP.			
44	Jaudub Ghose,	Singarhat.	Best	1	8
	(G)	CARROTS.			
3	Cheroo Ghose,	Moocheekollah.	Best	1	8
	(H)	TOMATO.			
155	Tarachund,	Ballygunge.	Best	,,	8
	(I)	BEANS.			
Not Reg.	Drenoo Mallee,	Unknown.	Best	1	8
	(J)	PERSIAN TOMATO.			
		Swedish Turnip. English Bean from Seed brought by Lord Auckland.			

Reg No	*Names.*	*Situation of Garden.*	*Sample.*	*Medals awarded.*	*Donations.*
Not Reg.	Roopchund,	Tittaghur.		1	8
	(K)	CABBAGE.			
217	Soroop Koran,	Moocheekollah.	Best	1	,,
	(L)	POTATOES FROM SYLHET SEED.			
204	Moocheeram Ghose,	Moocheekollah.	Best	1	,,
	(M)	POTATOES.			
Not Reg.	Pindub Doss,	Moocheekollah.	Best	,,	5
	(N)	KNOLE COLE.			
1	Hullodhur Doss,	Moocheekollah.			8
	(O)	TENASSERIM YAM.			
Not Reg.	Goluck Mohun,	Unknown.			5
	(P)	SEA KALE.			
4	Beenud Mallee,	Jharoula.			4
	(Q)	GREEN KALE.			
Not Reg.	Mr. Speed's Mallee,	Allipore.	Best		4
	(R)	ONION.			
140	Balaram Chuttack	Bailla.	Best		4
	(S)	TENASSERIM POTATOES.			
152	Jainub Mallee,	Moocheekollah.	Best		4
	(T)	CARROTS FROM ACCLIMATED SEED.			
173	Bissonauth,	Serittie.	Best	,,	6
	(U)	JERUSALEM ARTICHOKE.			
Not Reg.	Unknown,	Unknown.	Best	,,	4
	(V)	FRENCH BEANS.			
170	Gioochurn,	Modóoi	Best	,,	4
	(W)	WHITE BRINJAL.			
Not Reg.	Gioochurn,	Unknown.	Best		3
	(X)	CAPSICUM.			
Not Reg.	Unknown,	Unknown.	Best		2
	(Y)	VEGETABLE MARROW.			
Not Reg.	Unknown,	Unknown.	Best		4
	Total Medals, ...			11	166
	In addition to the above, Mrs. Russell, distributed to unsuccessful Mallees Donations of, 1 Rupee each,				18
	Grand Total, ...			11	184

REMARKS.

The vegetables in general did not present so fine an appearance as in the preceding year, owing to the season being unfavourable to their developement.

JOHN BELL,

Secretary.

Report of the Committee of Papers upon the motion of the Rev. Mr. Boaz, to offer a premium for an Agri- and Horticultural Manual.

In conformity with the 2nd resolution proposed on the 17th February, the Committee of Papers consisting of Dr. Wallich, Mr. Storm, and the Secretary, had the honour of waiting upon the President, on Tuesday morning, the 21st, according to appointment; when the following propositions were again read.

1st. Proposed by the Rev. T. Boaz, and seconded by H. Walters, Esq. "That a Premium of 1000 Rs. be offered to any person who will compile in English, an Indian Agricultural and Horticultural Manual, to be approved by the Society, and translated into Hindostanee and Bengalee; and that the Society subscribe for 200 copies translated into the Native Languages."

2nd. "That Premiums be offered on a liberal scale for the best and most approved produce of every description; as Silk, Indigo, Rice, Sugar, &c. &c.

N. B. "The Society possess large funds, and unless they propose to establish a Bank of India, there is no use in accumulating funds. They should be spread over the country like manure, as received, and would thus assist in bringing forth fruits. All the funds required to be kept in hand, should be sufficient alone to meet current expences and contingencies, for printing, &c. All the surplus should be laid out in promoting, by every possible means, the objects of the Society."

After some discussion, it was proposed, and resolved; that the question be referred to the Committee of Papers for their consideration, and that it be brought forward at the next meeting.

REPORT.

After giving the subject of the above motion their fullest consideration, your Committee regret that they cannot recommend its adoption, on the following grounds, viz.

1st. That the pursuits of Agriculture and Horticulture in India are so distinct, that no individual could be found to possess a practical knowledge of both, to be of any real utility.

2d. If the motion were confined to an Horticultural Manual, there is

no individual, who could, from his own experience, compile such a work at present.

3rd. That a Manual compiled from borrowed sources would be, at best, a very doubtful reference, since information derived from native gardeners is not to be relied on. In proof of this, it is only necessary to compare the quality of vegetables, peas excepted, which require no skill in rearing, grown in the gardens of private individuals, with those grown by Mallees, in their own grounds. In the former, the temptation of high wages will not induce them to grow cauliflower, cabbage, celery, turnips, carrots, &c. equal to their own; and the Committee do not think that any reliance could be placed in oral directions, afforded by such people, and on which sources, the compiler of a manual must mainly depend.

4th. That a manual compiled in Calcutta, would naturally apply to experience confined to this immediate locality, and could not be of practical utility to many parts of India, (where such a directory is more immediately called for), in consequence of the great difference of soil, climate and seasons.

5th. That a Premium now held out, might stifle general enquiry and individual application to Horticultural pursuits; as this inference drawn from the offer of such reward, would lead those who are now quietly engaged in seeking information from actual experiment, to rest satisfied that in a short time they would be put in possession of a guide, which, after all, might end in disappointment, both to the compiler and to the public, should it not be approved by the Society.

6th. That this motion, if adopted, would interfere with and embarrass the arrangements which the Agricultural Committee have still under consideration in regard to a motion brought forward on the 12th October last, by Mr. Staunton, viz. That Premiums be offered to native Mallees for the best Essays on kitchen gardening, subject to Mr. Archibald Grant's amendment, that separate essays should be called for referring to the different classes of vegetables. Upon these grounds, your Committee cannot recommend the adoption of the motion, now referred to them by the Society, as far as Horticulture is concerned.

On the subject of offering a premium for an Agricultural Manual, your Committee believe that it will require very little argument to shew that the idea is impracticable. It would be no difficult task to compile

a book from what has been collected; but to do this would only be to throw into a condensed and systematic form the materials already published in your own Transactions; and for such an abstract, your Committee would not feel justified in recommending a premium.

On the 2d motion embodied in the Rev. Mr. Boaz's Memorandum; "That Premiums be offered on a liberal scale for the best and most approved produce of every description; as Silk, Indigo, Rice, Sugar, &c. &c. on the grounds of the Society's possessing large funds," &c. your Committee beg leave to offer a few remarks.

Indigo, has been brought to such perfection in India, that no other country can compete with it in the English market; hence, the Society would be throwing away money in offering a premium for the best.

Rice. The cultivation of this article being entirely in the hands of natives, it would be quite impossible to discover the actual grower; and the Society might be awarding a premium for the best sample brought from the Burra bazar.

Silk. No reward which the Society could offer, would tempt an individual, who was not already engaged in the business, to take it up. To those who are engaged, the most stimulating premium, appears to your Committee to be, the successful competition of Italy and China; and as the profits upon the trade depend essentially upon an improvement in quality, the risk of sinking under such competition, will, your Committee conceive, have a far more beneficial effect in whetting European ingenuity in India, than the highest solitary premium within the gift of the Society.

Sugar. The most approved produce of the cane, would naturally be the finest; and your Committee, consider that such an application of the funds would be injudicious. We do not want India to produce *finer* or *coarser* Sugar than is now produced; but your Committee wish to see Sugar manufactured of such a quality as may come into successful competition with the strong grained Muscovado of the West; and this cannot, in the opinion of your Committee, be better effected than by pursuing the course in which the Society are now engaged; viz. of endeavouring to place within reach of applicants a *superior plant.*

If any Premium be deemed expedient by the Society, to promote the Sugar trade of the East, your Committee think, the object would be attain-

ed more successfully by offering it to any individual, who could, within a prescribed period, exhibit a given surface of vigorous Otaheite Cane in Bengal,* to be held at the disposal of the Society for general distribution.

In conclusion, your Committee beg leave to draw the Society's attention to the results likely to follow the adoption of the suggestion offered by the Rev. Mr. Boaz, viz. " They (the funds) should be spread over the country like manure, as received, and would thus assist in bringing forth fruits. All the funds required to be kept in hand should be sufficient alone to meet current expences and contingencies, to pay for printing, &c. All the surplus should be laid out in promoting, by every possible means, the objects of the Society."

Your Committee are of opinion, that it is highly important to husband their resources; for in proportion to the command of their capital, will be their means of introducing important improvements in husbandry.

It must be held in remembrance, that the Society is only recovering from the depressed state, to which its operations were reduced a few years ago, by the absorption of its capital in the maintenance of an Experimental Garden at Allipore; and it behoves your Committee to be cautious in recommending any measures which might be accompanied by similar unfortunate results; and a motion passed without due consideration at a General Meeting, might involve the Society in difficulties similar to those from which we are now only recovering.

To compass the objects of a Society constituted as this, by spreading its funds over the country, as received, would be, your Committee conceive, to aim at impossibilities, and to place the Society in a powerless and inefficient position.

Without a fixed capital for carrying into effect important measures, when duly considered and approved, the Society can never expect to be instrumental in producing great improvement in Indian agriculture; and entertaining this view, they are averse, to plunge blindfold into schemes, which would deprive the Society of what they have been enabled to set aside from the increasing prosperity of an Institution, which not only admits of a free and liberal dissemination of seeds from abroad, but has placed at its disposal a considerable surplus capital, to meet contin-

* Your Committee would confine it to Bengal; since in the Upper Provinces, the exertions of Major SLEEMAN have earned for him the thanks of all India.

gencies on a more extended scale of usefulness, when fitting opportunities occur for its expenditure. But your Committee feel themselves called upon to deprecate the idea of lavishing the Society's funds improvidently, and while they contend for the exercise of due discretion, they beg to assure you that they are ever ready to recommend the disposal of your finances to meet the legitimate objects for which they are left to accumulate, after giving effect to all measures of an useful tendency, and your Committee believe that in no one instance have they been withheld; which is apparent, in looking at the liberal supplies of cotton and other seeds that have been provided during the last two years, the abundance of which is best attested by the fact that they have been freely distributed not only to applicants, but have been dispensed far beyond the limits of the Bay of Bengal.

With reference therefore to the important points involved in the motion of the Rev. Mr. Boaz, your Committee, after due consideration, deem it imprudent to recommend its adoption, and beg leave to submit the following propositions for the guidance of the Society in future.

Propositions.

1st. That notice of motion be given on all questions relating to Finance, at a general meeting, preceding that on which the subject is to be disposed of; in order that members who take an interest in the question may have an opportunity of signifying their assent or objection, either verbally or in writing; and that all such notices be recorded in the Journals along with the usual proceedings.

2nd. That motions of which previous notice has been given, take precedence of all others.

3rd. That the same rules are applicable to all new motions involving points of importance; and that no resolution be passed at the same time that it be brought forward, unless the case be *urgent.*

4th. That the above Resolutions be adopted, and added to the Standing Rules of the Society.

E. RYAN.
N. WALLICH.
W. STORM.
JOHN BELL.

Premiums for Agricultural and Horticultural Manuals.

At a General Meeting of the Society, on Wednesday, April 12, 1837. It was proposed by Mr. Walters; seconded by Mr. Robison, and

Resolved, 1st. That a Premium of Rs. 2,000 be offered for the best work on Indian Agriculture in all its branches, founded on experience in the country, to be presented to the Society on, or before, the 1st May, 1840.

Resolved, 2nd. That a Premium of Rs. 1,000 be offered for the best work on the Horticulture of Bengal, to be presented to the Society on, or before, the 1st May, 1840.

Resolved, 3rd. That a Premium of Rs. 1,000 be offered for the best work on the Horticulture of the Western Provinces, to be presented to the Society on, or before, the 1st May, 1840.

Resolved, 4th. That the Society reserves to itself the right of refusing to grant any of the above premiums, if the works on the above subjects are not such as it approves.

Resolved, 5th. That the Society do invest in Government Securities, the sum of Rs. 4,000 for the payment of the above premiums.

Resolved, 6th. That the authors who may receive any of the above Premiums, shall, within six months after the receipt thereof, publish the treatises to which such Premiums shall have been awarded; or the Society shall have the option of publishing, in case the authors shall neglect to do so, within the time above prescribed.

Resolved, 7th. That the Secretary do advertize in all the public Journals, 4 times in each year, the Proposed Premiums.

REPORT.

Report of a Committee appointed to consider the proposition of H. Walters, Esq., to award Medals for the best samples of Indian Staple Products.

At a meeting of the Agricultural and Horticultural Society, held on the 12th day of April last, it was resolved, on the motion of Mr. Walters, seconded by Sir Edward Ryan, "That gold and silver medals be awarded annually, to the producers of the best samples of the Staple Products of British India, under such conditions and arrangements as may

be determined on by a Committee appointed for that purpose; and that the following numbers form the Committee, viz.

Mr. WALTERS,
Mr. G. A. PRINSEP,
and
Mr. ROBISON.

2nd. In proceeding with the task assigned them, the attention of your Committee was naturally directed to the several products which a few years ago were considered by the Society and by Government, the most deserving of encouragement and reward; and to that part of the advertisement then issued by the Society, which offered premiums of Rs. 500 and Rupees 250 for the best, and second best small samples of Cotton, Sugar, Silk, and Tobacco. The expectations of the Society were then, unfortunately, frustrated by the total loss of its funds; but its pecuniary affairs being now prosperous, and the Society having resolved upon granting gold and silver medals, your Committee is of opinion, that these cannot be better bestowed, during the first year, at least, than in rewarding the exertions of the most successful cultivators of the several articles above enumerated, which the Society has already, in consideration of their importance, encouraged the improvement of, by offering rewards, which they afterwards could not bestow.

3rd. The following would, therefore, be the articles entitled to medals, and the conditions under which your Committee recommend they should be awarded.

1st. For the best Sample of Muscovado or Raw Sugar, in weight not less than 2 maunds,

The Gold Medal.

For the second best Sample, as above,

The Silver Medal.

2nd. For the best Sample of Silk, in weight, not less than 2 seers,

The Gold Medal.

For the second best Sample, as above,

The Silver Medal.

3rd. For the best Sample of Cotton, from any Foreign Seed, in weight not less than one maund,

The Gold Medal.

For the second best Sample, as above,

The Silver Medal.

4th. For the best Sample of Tobacco, from Foreign Seed, in weight not less than a maund,

The Gold Medal.

For the second best Sample, as above,

The Silver Medal.

CONDITIONS.

1st. The competition shall be open to all persons whatever.

2nd. The articles shown shall be the produce of British India, giving the preference to the Presidencies of Bengal and Agra, and their dependencies.

3rd. They shall not be culled from larger quantities, but be, bonâ fide, average specimens of the whole crop where grown.

4th. Competitors shall deliver along with the specimens, detailed statements of the place where grown, quality or nature of soil, mode of culture and manufacture, and of every item of cost.

5th. *One half* of the specimens declared entitled to the Gold Medals shall be the property of the Society; the rest shall be returned to the competitors.

6th. The specimens sent in shall be accompanied by a distinguishing mark, corresponding with one on a sealed letter, containing the name of the candidate, and which is not to be opened till after adjudication.

7th. Should two or more specimens be equal, the Medals will be awarded to that one which appears to have been raised at the smallest cost.

8th. All specimens offered for competition, shall be in the hands of the Secretary. on or before the 1st day of May, 1838, and the medals shall be awarded on or before the 1st of June thereafter.

4th. Your Committee is glad to state, that dies of a medal executed for the Society, ten or twelve years ago, of which they now exhibit an impression, are in the hands of Mr. James Prinsep; and that *Gold* Medals can be struck from them at an expense of from 100 to 150, and Silver Medals, at an expense of from 15 to 20 Rs. each.

5th. Although your Committee have recommended the limitation of medals during the first year, to four Gold, and four Silver ones, they beg it to be understood that, in conformity with the Resolution of the Society, they are anxious to extend these rewards to many other articles of produce; such as Flax and Hemp; to Spices and Drugs, such as Vanilla; to improved processes of manufacture, and to Inventions and Machines. They would also desire to bestow medals upon Zemindars for improvements on their estates, by judiciously constructed canals, tanks, roads and bridges; by the clearing of forests, &c.; by the draining of jheels; and, in short, by any other processes by which private estates, and the country generally, would be improved and benefited. The medals bestowed, during the first year, upon Cotton, Sugar, Silk and Tobacco, might be omitted during the second, and other articles substituted, so as not in any one year to bestow too many medals, and lower their value or usefulness in public estimation. In conclusion, your Committee propose the following, as the advertisement for the first year.

AGRICULTURAL AND HORTICULTURAL SOCIETY.

It having been resolved upon, at a meeting held on the 12th April, 1837, to award Gold and Silver Medals to the producers of the best samples of the Staple Products of British India, the Society is desirous of making known the conditions under which the distribution of these medals is to take place.

1st. For the best Sample of Muscovado or Raw Sugar, not less than 2 maunds,

The Gold Medal.

For the second best Sample of Muscovado or Raw Sugar, as above,

The Silver Medal.

2nd. For the best Sample of Silk, not less than 2 seers,

The Gold Medal.

For the Second best Sample of Silk,

The Silver Medal.

3rd. For the best Sample of Cotton, raised from Foreign Seed, not less than 2 maunds,

The Gold Medal.

For the second best Sample, as above,

The Silver Medal.

4th. For the best Sample of Tobacco, raised from Foreign Seed, not less than 1 maund,

The Gold Medal.

For the second best Sample of Tobacco,

The Silver Medal.

CONDITIONS.

1st. The articles exhibited by candidates for medals, must be the produce of British India, the preference being given to the Bengal and Agra Presidencies, and their dependencies.

2nd. The competition will be open to all persons whatever, European and Native, Zemindar or Ryut.

3rd. The articles must not be culled from larger quantities, but be, bonâ fide, the average produce of the land on which they are grown.

4th. All candidates for medals must deliver along with their specimens, statements of the place where the articles were grown, the quality or nature of the soil, mode of cultivation, and of every cost.

5th. *One-half* of the specimens declared entitled to the *Gold Medals* shall be the property of the Society, the remainder will be returned to the candidates.

6th. The candidates must affix to their specimens a number, or mark, and must forward to the Secretary a sealed letter, containing a similar number or mark, together with the name and address of the candidate; which latter shall not be opened till after adjudication.

7th. When two or more samples appear to be of equal quality, the premium will be awarded to the sample which appears to have been raised at the least cost.

8th. All candidates for medals must have their specimens in the hands of the Secretary of the Society, on or before the 1st of May, 1838, and the medals will be distributed on the 1st of June following.

H. WALTERS.
G. A. PRINSEP.
C. K. ROBISON.

To

Agricultural and Horticultural Society,
Town Hall, Calcutta, March, 1837.

The Agricultural and Horticultural Society of India, desirous of obtaining all the information it is possible to collect on the resources of your district, as well as to dispense all the assistance in their power, to improve such resources by forwarding Seeds, Plants, &c. after giving due consideration to the means best calculated to insure this end, are of opinion that the first step towards it, would be, to form a Branch Society at your station; and with the Funds derivable from Subscriptions and Donations from Members, to establish an Experimental Garden or Farm. wherein to test the probable success that would attend the introduction of Seeds and Plants not commonly cultivated, or of kinds superior in quality to those already introduced.*

2nd. The Society of India do not consider it necessary to suggest for your consideration, any fixed rules for such a Branch Society; since every Institution of this nature may wish to adopt such as may be best calculated to meet the peculiar demands of the district and feelings of the inhabitants; but they think that a copy of their own rules may be acceptable, so as to be modified or remodelled according to circumstances; and therefore annex one for your information.

3rd. Before I advert to the principal questions hereafter proposed, I beg leave to draw your attention to the annexed copies of a letter which I addressed to Mr. Secretary PRINSEP by desire of the Society, and of the reply to the same; as they will best convey to you the feelings of Government on the subject.

I have the honour to be,
Your most obedient humble servant,
JOHN BELL,
Secretary Agr. and Hor. Society of India.

* Already there are several Branch of Corresponding Societies established; as at Hooghly, Burdwan, Beerbhoom, Berhampore, Lucknow and Meerut.

To H. T. PRINSEP, Esq.

Secretary to Government, General Department.

SIR,—At the last General Meeting of the Agricultural Society, a paper was submitted by H. WALTERS, Esq. embodying a series of suggestions, on the importance of encouraging the formation of Branch Societies throughout India, the utility of which was recognized and unanimously approved by the Members present.

In order the more effectually to ensure success, I have been directed by the Committee appointed to carry Mr. WALTERS's views into effect, to draw up a few practical queries, to be printed and circulated among such Members of this, and other, or Branch Societies already established, as are known to take an interest in Agricultural pursuits, and who may be enabled, from personal observation and minute enquiry, to give such information as will tend to dissipate the ignorance which prevails in regard to the varieties of Soil, Climate, and general features of the different districts, and thus afford the Society a fund of valuable data which cannot fail to be attended with future benefit, in directing attention to the successful application of experiments in those parts, where reasonable hopes may be entertained of introducing products of a superior quality.

2nd. In order to give weight and energy to the operations of the Committee, it has been deemed advisable, and I am directed accordingly, to solicit the countenance of Government in favour of the utility of the measure, which would at once act as a stimulus to exertion in those who might otherwise treat the subject as trivial.

3rd. I am further desired to request permission to publish the letter which Government may be pleased to address, in conjunction with the queries, as evidence of the solicitude taken by Government in the objects of this Society.

I have the honour to be,

SIR,

With respect,

Your obedient servant,

(Signed) JOHN BELL,

Secretary Agr. and Hor. Society of India.

Agricultural and Horticultural Society's Office,
Calcutta, February 3rd, 1837.

To JOHN BELL, Esq.

Secretary to the Agricultural and Horticultural Society.

SIR,

I am directed to acknowledge the receipt of your letter of the 3rd instant, and in reply to state that the Right Honourable the Governor of Bengal participates in the desire expressed by the Agricultural Society, to create an interest in the objects it aims to promote amongst public officers and others residing in the interior.

2d. It will always give satisfaction to his Lordship to see the Society offering suggestions and circulating questions of practical benefit amongst intelligent Residents in the interior, through whom the objects of the Society may best be promoted, and letters on such subjects not excessive in dimensions, may be sent to this Department to be circulated free of postage.

3rd. His Lordship cannot doubt that the communications of the Society will be received by all public officers with the same desire to forward its purposes that is felt by his Lordship.

I am, &c.

(Signed) H. T. PRINSEP,

Secretary to Government

Fort William, February 8th, 1837.

1st. The nature of the Soil, and Climate of the District?

2nd. The manner in which the Land is possessed, by great or small proprietors?

3rd. The manner in which the Land is occupied, whether by great or small Farms?

4th. The manner in which the land is employed, whether in Pasture, in Husbandry, or both?

5th. If in pasture, what Grasses are cultivated? Has the Guinea Grass been tried? and if so, to what extent do you think it could be advantageously introduced? Has the Clover been tried, and with what success?

6th. What species of Stock is kept? Whether the Breeds can be improved, or whether new Breeds ought to be tried? Is there any in-

dividual in your District who would be disposed to pay attention to improving the Breed of Cattle?

7th. Whether any of the Land is watered, and whether any considerable extent of ground is capable of that improvement?

8th. For what particular Crops is land in your District irrigated, and what is the mode of irrigation?

9th. If the Land is employed in Husbandry, what Crops are cultivated?

10th. What is the rotation of Crops?

11th. Is Indigo cultivated, and to what extent? Is Cotton cultivated, and to what extent? Is Sugar-cane cultivated, and to what extent?

12th. What are the peculiarities of the Soils, occupied by these articles?

13th. Have the varieties of Foreign Cotton been tried, and with what success? Has the Otaheite Cane been introduced, to what extent, and with what success?

14th. Is Fallowing practised, or is the same land applied to the same purpose from year to year?

15th. Is Manure used, and of what kind? Could the system of manuring be extended, and could the Natives be induced to pen their Cattle, instead of using the manure as fuel?

16th. Are Oxen or Buffaloes commonly used? Would Mules not be preferable for draft?

17th. What are the usual sorts of ploughs, carts, and other implements of Husbandry? Could originals or models be procured for this Society without much inconvenience?

18th. What is the usual seed time and harvest for the different crops?

19th. What is the extent of Waste Lands, and the improvement of which they are most capable?

20th. What is the rate of wages and price of labour? and what are the hours at which labour commences, and ceases at the different seasons?

21st. Is any attention paid to draining lands, and what sort of drains are used?

22nd. Is any attention paid to Embankments?

23rd. Is the country well wooded, and what sort of timber is chiefly grown?

24th. What is the state of the Roads?

25th. Is the district intersected by Streams?

26th. Is land or water carriage resorted to for the conveyance of produce?

27th. To what extent have Manufactures or Commerce been carried on in the district, and have they had either good, or bad effects on its Agriculture?

28th. If a Manufacturing District, what proportion of the Population has been thrown out of work, by the cheaper imported European cottons; and have they taken to any other employment?

29th. Are there any other Societies instituted in the district for the improvement of Agriculture?

30th. Do the Natives seem to have a turn for improvements, or how could such a spirit be best excited?

31st. Are there any obstacles to improvements; and in what manner can they best be removed?

32nd. Is there any individual, who could favour the Society with a rough Map of your District, subdividing the lands by colours, in reference to the portions cultivated by particular crops, say blue for Indigo, brown for Sugar, yellow for Rice, green for Pasture, white for Waste Lands, and so on?

33rd. What are the names and address of those who are the most active, or the most skilful improvers in the district, and who are the most likely to be useful Correspondents of the Agricultural and Horticultural Society of India?

34th. Could any number of influential Native Landlords or Farmers be induced to join a Branch Society in your district, and to promote its objects by personal exertions?

REGULATIONS *for the* AGRICULTURAL *and* HORTICULTURAL SOCIETY *of* INDIA, *as sanctioned at a General Meeting, March 11th,* 1835.

ARTICLE 1. The promotion and improvement of the Agriculture and Horticulture of India constitute the objects of the Society.

2. Gentlemen of every nation shall be eligible as Members of the Society.

3. Candidates for admission as Ordinary Members, shall be proposed

by two members at a General Meeting, and balloted for at the succeeding, when a majority of votes will determine the election.

4. Honorary Members shall be persons eminent for their knowledge of, or encouragement given to Agriculture or Horticulture; or for services rendered to the Society. They are to be proposed and balloted for as Ordinary Members; but two-thirds of the votes are to determine their election.

5. Ordinary Members are to pay an admission fee of Eight Rupees, and the same sum quarterly, in advance, so long as they continue resident within the Presidencies of Bengal or Agra. It shall be optional for any Member to compound for the quarterly contributions by the payment of 150 Rupees to the funds of the Society.

6. Resident Members failing to pay their contributions for one year, the same having been duly demanded, shall cease to be Members of the Society, and their names shall be erased from its list.

7. The Office-bearers shall be elected annually, consisting of

1 President;
4 Vice-Presidents, two of whom shall always be Natives;
2 Secretaries, one European and the other Native;
1 Collector.

8. A General Committee shall also be elected annually, consisting of the Office-bearers and six Members.

9. General Meetings shall be held at the Society's Apartments in the Town Hall, on the second Wednesday of every month, throughout the year.

10. The election of Office-bearers shall take place at the Anniversary Meeting in January.

11. Special Meetings may be convened at any time, on a requisition to that effect, signed by at least six Members.

12. The Bank of Bengal shall be the Treasurers of the Society; and any surplus in their hand of 500 Rupees, (over and above what may be required for current expenses,) shall be invested in Government Securities, on behalf of the Society, in the joint names of the Secretary and Collector for the time being.

13. Such communications made to the Society, as may be deemed of public utility by the Committee, shall be published, whenever a sufficient number have been collected to form part at least of a volume.

ADVERTISEMENT.

AGRICULTURAL AND HORTICULTURAL SOCIETY OF INDIA.

Premiums for Works on Agriculture and Horticulture.

It having been resolved upon, at a Meeting held on the 12th April, 1837, that Premiums should be offered for the best works on Indian Agriculture and Horticulture, the following Resolutions, passed on that occasion, are advertised for general information.

1st.—For the best work on Indian Agriculture in all its branches, founded on experience in the country, to be presented to the Society, on or before the 1st May, 1840,

Two Thousand Rupees.

2nd.—For the best work on the Agriculture of Bengal, to be presented to the Society, on or before the 1st May, 1840,

One Thousand Rupees.

3rd.—For the best work on the Horticulture of the Western Provinces, to be presented to the Society, on or before the 1st May, 1840,

One Thousand Rupees.

CONDITIONS.

1st.—The Society reserves to itself the right of refusing to grant any of the above Premiums, if the works on the above subjects, are not such as it approves.

2nd.—The Authors who may receive any of the above Premiums, shall, within six months after the receipt thereof, publish the Treatises to which such Premiums shall have been awarded, or the Society shall have the option of publishing, in case the Authors shall neglect to do so within the time above prescribed.

Medals for encouraging improvement in the Staple Products of British India.

It having likewise been resolved upon, at a Meeting held on the same date, to award Gold and Silver Medals to the Producers of the best Staple Products of British India, the Society is desirous of making known the conditions under which the distribution of these Medals is to take place.

1st.—For the best Sample of Muscovado or Raw Sugar, not less than 2 maunds,

The Gold Medal.

For the second best Sample of Muscovado or Raw Sugar, as above,

The Silver Medal.

2nd.—For the best Sample of Silk, not less than two seers,

The Gold Medal.

For the second best Sample of Silk,

The Silver Medal.

3rd.—For the best Sample of Cotton, raised from Foreign Seed, not less than 2 maunds,

The Gold Medal.

For the second best Sample, as above,

The Silver Medal.

4th.—For best Sample of Tobacco, reared from Foreign Seed, not less than 1 maund,

The Gold Medal.

For the second best Sample of Tobacco,

The Silver Medal.

CONDITIONS.

1st.—The Articles exhibited by candidates for Medals, must be the produce of British India, the preference being given to the Bengal and Agra Presidencies, and their dependencies.

2nd.—The competition will be open to all persons whatever, European and Native, Zemindar or Ryut.

3rd.—The Articles must not be culled from larger quantities, but be, bona fide, the average produce of the land on which they are grown.

4th.—All candidates for Medals must deliver, along with their speci-

mens, statements of the place where the Articles *were* grown, the quality or nature of the soil, mode of cultivation, and of every cost.

5th.—*One-half* of the specimens declared entitled to the *Gold Medals*, shall be the property of the Society, the remainder will be returned to the candidates.

6th.—The candidates must affix to their specimens, a number or mark, and must forward to the Secretary a sealed letter, containing a similar number or mark, together with the name and address of the candidate; which letter shall not be opened till after adjudication.

7th.—When two or more Samples appear to be of equal quality, the premium will be awarded to the Sample which appears to have been raised at the least cost.

8th.—All candidates for Medals must leave their specimens in the hands of the Secretary of the Society, on or before the 1st May, 1833, and the Medals will be distributed on the 1st June following.

JOHN BELL, *Secretary*,
Agricultural and Horticultural Society of India.

Town Hall, May 11, 1837.

Town Hall, Calcutta, 11*th January,* 1837.

A general Meeting of this Society was held in the Town Hall this morning, for the election of office bearers for the present year.

Members Present.

N. Wallich, Esq. M. D., V. P., in the chair.

The Hon. Col. Rehling.	H. Walters, Esq.
J. P. Grant, Esq.	W. Storm, Esq.
Dr. Huffnagle.	Captain T. Leach.
Chas. Hutchins, Esq.	David Hare, Esq.
Archd. Grant, Esq.	H. M. Low, Esq. and
J. W. Masters, Esq.	John Bell, Esq.

Visitors.

D. Helfer, M. D.	G. A. Prinsep, Esq.
G. R. Campbell, Esq.	

The Secretary informed the meeting that Sir Edward Ryan was unable to attend, in consequence of other engagements.

The following gentlemen proposed last month were duly elected:—

Members by Ballot.

G. H. Smith, Esq.	J. H. Stocqueler, Esq.
Lieutenant E. Baker.	W. G. Rose, Esq.
Dr. B. Burt.	and
W. M. Dirom, Esq.	The Rev. Mr. Boaz.

The following gentlemen were proposed for election next month:—

F. Corbyn, Esq. M. D. proposed by Dr. Wallich, and seconded by John Bell, Esq.

W. B. O'Shaughnessy, Esq. M. D. proposed by Dr. Wallich, and seconded by John Bell, Esq.

H. Goodeve, Esq. M. D. proposed by Dr. Wallich, and seconded by W. C. Hurry, Esq.

John Haines, Esq. proposed by Dr. Wallich, and seconded by W. C. Hurry, Esq.

Alexander Colvin, Esq., proposed by J. C. Wilson, Esq. and seconded by H. M. Low, Esq.

H. Cowie, Esq. proposed by J. C. Wilson, Esq. and seconded by H. M. Low, Esq.

J. Sydney Stopford, Esq. proposed by J. C. Wilson, Esq. and seconded by H. Walters, Esq.

Alexander Beattie, Esq. proposed by J. C. Wilson, Esq. and seconded by H. Walters, Esq.

G. T. F. Speed, Esq. proposed by W. Storm, Esq. and seconded by John Bell, Esq.

D. W. H. Speed, Esq. proposed by John Bell, Esq. and seconded by W. Storm, Esq.

E. Latour, Esq. (C. S. Malda,) proposed by W. Storm, Esq. and seconded by P. Macarthur, Esq.

M. Maclean, Esq. (Culna) proposed by W. Storm, Esq. and seconded by John Bell, Esq.

J. R. Colvin, Esq. proposed by J. P. Grant, Esq. and seconded by D. Hare, Esq.

G. A. Prinsep, Esq. proposed by Dr. Wallich, and seconded by W. Storm, Esq.

The proceedings of the last meeting having been read and confirmed,

the Vice President called attention to the lists of officers for the past year which lay on the table, and requested members present to substitute any other names they chose, intimating that Colonel Dunlop, one of the Vice Presidents, being absent, that appointment required to be filled up.

C. K. Robison, Esq. was accordingly elected in the room of Colonel Dunlop, all the other officers were re-elected; the list therefore stands as follows :—

Patron.

The Right Honourable George Lord Auckland, G. C. B. &c. &c.

President.

The Honourable Sir E. Ryan, Kt.

Vice Presidents.

N. Wallich, Esq. M. D. His Highness Nuwab Towharjung.
C. K. Robison, Esq. Baboo Radhakant Deb.

General Committee.

Dr. F. P. Strong, D. Hare, Esq.
W. Storm, Esq. H. M. Low, Esq.
Joseph Willis, Esq. Baboo Radhamadub Banerjia.

Committee of Papers.

N. Wallich, Esq. M. D. John Bell, Esq.
W. Storm, Esq.

Agricultural Committee.

N. Wallich, Esq. M. D. John Bell, Esq.
W. Storm, Esq.

Secretary and Collector.

John Bell, Esq.

The Vice President stated that a very unfortunate mistake had been made by the Committee appointed to make arrangements for the Ball proposed to be given to the Honourable Miss Edens, in fixing upon the evening of the day, last fixed for the annual exhibition of vegetables and the Society's dinner, and suggested that some definite understanding should immediately take place, as the season for vegetables had arrived.

Mr. H. M. Low proposed, and was generally seconded, that a Committee be immediately appointed to wait upon the Honourable Miss Edens, or upon the Ball Committee, to point out the injury which the Mallees would sustain, if any further delay were occasiond. A member pre-

sent, however, stated that the circumstance had already been hinted to the ladies, who were quite indifferent to the evening that might be fixed, and Messrs. Low and Hutchins were accordingly requested to wait upon Mr. Shakespeare, who agreed to name the 17th for the ball, and that the 18th instant, as previously determined, should be reserved for the exhibition and dinner.

The President next called attention to a report which the Secretary had drawn up, of the Society's proceedings during the past year, which exhibited most satisfactory proof of the continued and greatly increasing prosperity of the Society. In the course of 1836, sixty-nine new members have been elected, not including 14 names proposed this day, while only four resignations had taken place, and those were members leaving India. The pleasing view of the Society's progress was damped by the record of the deaths of two highly respected members, viz. James Kyd, Esq. and Capt. Wm. Bell.

Resolved,—That the Report read by the Secretary be adopted and published in the Society's Transactions.

The Collector's report was next read, showing that from the 1st January to 31st December, 1836, Co's. Rs. 11,531 1 1, had been collected, which, with the cash balance on the 31st December, 1835, made up a sum of Rs. 13,433 2 1.

The disbursements had been very heavy, upwards of 4,000 Rs. had been expended on seed, and upwards of 2,000 Rs. on printing the Society's Transactions in English and Bengalee.

Freight on seeds, the maintenance of the Society's nursery, medals, and rewards, establishment, advertisements, &c. constituted the other chief items of expense, amounting in all, including those already stated above, to Rs. 9,740 13.

The Collector had likewise invested Rs. 3,207 10 6 in Government Securities, and placed them in the Government agency office for further accumulation. The amount of fixed assets vested in 4 and 5 per cent. paper, is now 14,000 rupees, exclusive of current interest.

Resolved,—That the Collector's report be adopted and his account and abstract of receipt and disbursements be published, in the Society's Transactions.

Resolved—That the thanks of the Society be given to Mr. Bell for drawing up their reports.

Resolved,—That the special thanks of the Society be offered to the office bearers for the past year.

Read a very interesting and highly important series of suggestions by H. Walters, Esq. drawing the attention of the Society, to the propriety of establishing branch societies throughout India; it would be injustice to Mr. Walters to attempt in this place, even an outline of his valuable paper. It will shortly be printed and acted upon.

Dr. Huffnagle presented to the meeting a catalogue of prizes and rewards dealt out by the Agricultural Society of Philadelphia, for the encouragement of Agriculture and Horticulture, which will form the basis of suggestions in regard to the future operations of this institution.

Read a letter from Government to the Secretary, requesting the co-operation of the Society in behalf of the objects for which the services of that distinguished naturalist, Dr. Helfer, had been engaged on his tour to the Coast of Tenasserim, &c.

The Secretary informed the meeting that he had immediately given effect to the letter of government, by putting up a valuable assortment of seeds, &c. which he had made over to Dr. Helfer with all the printed information he had at disposal.

As the business of the meeting was principally to elect office bearers, the reading of all other communications was deferred until February; one more letter, however, was submitted from Mr. Liddle, Secretary to the Madras Society, stating that a *model* of Capt. Dalrymple's plough might be obtained, but that the original plough had been offered by Capt. Dalrymple at prime cost and charges which would be about 100 Rs.

Resolved,—That the Society be requested to write and accept Capt. Dalrymple's polite offer.

JOHN BELL, *Secretary.*

Calcutta, Town Hall, Wednesday, 8th Feb. 1837.

A general meeting was held in the Town Hall, on Wednesday morning, at half past 9 o'clock.

Present.

The Honourable Sir E. Ryan, Kt. in the chair.

The Honourable Col. Rehling, W. Storm, Esq., H. Walters, Esq.,

— Huffnagle, Esq. M. D., John Allan, Esq., M. Staunton, Esq., Alexander Colvin, Esq., H. Cowie, Esq., Col. Caulfield, David Hare, Esq., F. P. Strong, Esq., N. Wallich, Esq. M. D., A. Dobbs, Esq., Arch. Grant, Esq., H. Wilson, Esq., Col. Colvin, The Rev. T. Boaz, G. Prinsep, Esq., and John Bell, Esq, Secretary.

Visitor.

Monsieur Delessert.

The proceedings of last meeting were read and confirmed.

The following gentlemen proposed in January last, were duly elected by ballot, viz.

F. Corbyn, Esq., W. B. O'Shaughnessy, M. D., H. H. Goodeve, M. D., J. Haines, Esq., Alexander Colvin, Esq., H. Cowie, Esq., J. S. Stopford, Esq., Alexander Beattie, Esq., G. T. F. Speed, Esq., D. W. H. Speed, Esq., E. Latour, Esq., C. S., M. Maclean, Esq., J. R. Colvin, Esq., C. S. and G. A. Prinsep, Esq.

The following gentlemen were proposed as members, viz.

J. F. Cathcart, Esq., C. S. proposed by the Secretary, for D. McFarlan, Esq., seconded by John Bell, Esq.

James Hills, Esq., G. S. Hills, Esq., James Hills, Junior, Esq., and Frederick Maclagan, Esq., proposed by Charles DeVerinne, Esq., seconded by John Bell, Esq.

Nathaniel Alexander, Esq., proposed by C. K. Robison, Esq., seconded by W. Storm, Esq.

Dr. W. Spier, proposed by Dr. Wallich, seconded by John Bell, Esq.

Dr. G. N. Cheek, proposed by Dr. Wallich, seconded by Dr. Strong.

M. Bignel, Esq., proposed by Dr. Wallich, seconded by John Bell, Esq.

G. Cheap, Esq., C. S., proposed by H. Walters, Esq., seconded by John Bell, Esq.

Dr. O'Dwyer, proposed by H. Walters, Esq., seconded by John Bell, Esq.

Captain Lysaght, proposed by H. Walters, Esq., seconded by John Bell, Esq.

W. H. Macnaghten, Esq., proposed by A. Dobbs, Esq., seconded by Sir E. Ryan.

Lieut. Hannyngton, proposed by Col. Caulfield, seconded by Dr. Wallich.

Baboo Maudhub Dutt, proposed by Col. Colvin, seconded by A. Colvin, Esq.

Col. Colvin presented to the Society a large bag, containing upwards of a maund of Upland Georgia Cotton, being the reproduction of several successive crops, derived from seed, originally brought from America, and forwarded through Dr. Wallich. This large sample was highly thought of by the meeting, and a bag of seed which accompanied it, shewed that it had experienced no deterioration.

Col. Colvin stated that he had induced 100 villages along the line of canal, to adopt the cultivation of this superior cotton, and had distributed to each village, seed sufficient to plant about one beegah, as a beginning. Colonel C. further informed the meeting, that the Natives were most anxious to obtain further supplies of seed, which will now be put within their reach, through the aid of R. Lowther, Esq., of Allahabad, who has kindly relieved Capt. Watt of the balance of seed, in that gentleman's department; Capt. Watt being under orders to march to Saugor.

Proposed by D. Hare, Esq., seconded by Dr. Wallich, and resolved unanimously,

That the special thanks of the Society be offered to Colonel Colvin for his zealous exertions, in introducing this cotton into Upper India, and for the fine sample this day produced.

Resolved further on a motion from the President, that this cotton be submitted for the opinions of such gentlemen as are competent to form a judgment of its quality.

Resolved, that the surplus cotton be made into cloth.

Proposed by Colonel Colvin, and resolved, that the Secretary be requested to address Mr. Lowther, the special Commissioner, at Allahabad, on the subject of a verbal communication, made to Colonel Colvin by Mr. Lowther, in December last, proposing to establish at that station, a Branch Society, and experimental farm, for the reception of such plants and seeds as might be forwarded by the Calcutta Society, for the purpose of supplying the wants of members and others beyond Allahabad; and with reference to the peculiar advantage, which that station possesses as a central department; that Mr. Lowther be solicited to ascertain how

far, by voluntary contributions and subscriptions, this desirable object could be carried into effect.

Proposed by the Rev. Mr. Boaz, seconded by H. Walters, Esq., that a premium of 1,000 rupees, be offered to any person who will compile in English an Indian Gardener's Manual, and that the Society do subscribe for 200 copies of the Translation in the Native languages.

Resolved, that the proposition of Mr. Boaz be referred to the Agricultural Committee for further consideration, and that it be brought forward for final determination at the next general meeting.

Proposed by the Secretary, and unanimously resolved, that the sum of one hundred rupees be allowed for the purpose of purchasing some seeds and bulbs, brought to this country by Monsieur Arnold, lately arrived in Calcutta, with a view to encourage him.

Proposed by the Secretary, seconded by W. Storm, Esq., and resolved, that with reference to the prosperous state of the Society's funds, a small sum (as may be recommended by the Committee of Papers) be left to the discretion of that Committee, to lay out from time to time in useful referential works relating to Agriculture and Horticulture.

Read extract of a letter to the address of H. Walters, Esq. from Captain Lysaght, dated Bolaram, near Hydrabad, soliciting a supply of fresh garden seeds. Captain L. states that in that quarter they have peas in August and September, and also in January.

Read extract of a note from H. Walters, Esq. to the Secretary, stating that the Collectors of Midnapore and Tipperah and the Judge of Mymunsing have written to him to say that they are desirous of establishing Branch Societies at their stations.

Mr. Walters suggested to the meeting the propriety of requesting the aid of Government to procure monthly returns of the prices of grain, from the magistrates and other officers, throughout the different districts; and that those functionaries be requested to forward their reports under cover post free to the Secretary of this Society.

Dr. Wallich submitted a pamphlet by Mr. N. B. Ward, '*on the growth of plants without open exposure of air*.'

The President stated, that the next paper, which he would bring forward, was one of great interest, that it was rather too long to be read at a meeting which he would be obliged to withdraw from immediately, but

the members would soon be gratified with a perusal of it in a printed form; he would only therefore at present give the substance in abstract.

The paper, Sir Edward added, was presented to the Society, and had been specially prepared for that purpose by Dr. McClelland, by desire of Lord Auckland, and is as follows.

Report on the physical condition of the Assam Tea plant, with reference to Geological structure and soils, by Dr. John McClelland.

This report is divided into the following heads:

1. Signs of subterranean movements on the northern frontier of Bengal.

2. Proofs of the upheavement of the Kossia mountains evinced by the remains of a talus extending along their base and by a raised beach characterised by terbary shells.

3. Geological structure of lower Assam and evidence of the local disturbance of rocks in this situation, and consequent obstruction of the Bramaputra.

4. Hydrographical extent of the rivers which enter Upper Assam, and a description of the alluvium they have then produced.

5. Tea plant connected with certain streams and confined to the alluvial basin.

6. How rice grounds are formed and sand banks converted into arable land.

7. How birds and wild animals contribute to these changes.

8. Tumuli and other remains of the former power of the Assamese, and how these affect the indigenous character of the tea plant in Assam.

9. Migration of the plant.

10. From whence derived.

Proposed by the President, seconded by Dr. Wallich, that Dr. McCleland's report, be forthwith published in the Society's Transactions.

From Ross D. Mangles, Esq. Secretary to Government, Revenue Department, dated 20th Dec. 1836, enclosing extract of a letter from the Court of Directors under date 27th July last, and with reference thereto, calling upon the Society to furnish a report of experiments made, from the American cotton seed, sent from England some years ago.

The Secretary had replied to the above call, by enclosing a copy of the Society's printed report, on the experiments in question.

From H. T. Prinsep, Esq. Secretary to Government General Department, dated 28th Dec. 1836, forwarding copy of a letter from the acting Secretary to the Bombay Government, dated the 12th Nov. addressed to the Government of Bengal on the subject of procuring a supply of the Otaheite Cane, and requesting the assistance of the Society on the occasion.

The Secretary had referred the question to Major Sleeman, soliciting that gentleman's aid, in forwarding a supply to the Collector at Ahmednuggur, as the Society have been disappointed in supplies from all quarters for their own nursery.

From W. Blundell, Esq. Moulmein, dated 24th Dec. 1836, acknowledging the receipt of cotton and other seeds, sugar-cane and coffee plants, which had been forwarded by desire of the President and with the assistance of Dr. Wallich.

From Capt. Watts, dated Allahabad, 14th January, in reply to the Secretary's letter of the 16th Dec. 1836, acknowledging receipt of the nine bags of cotton seed therein alluded to.

From the same, to the same, dated 27th January, intimating his regret, that in consequence of being under orders, to move from Allahabad to Saugor, he would no longer have it in his power to be useful to the Society, and that he had made over to R. Lowther, Esq. the remainder of the seed (cotton), which had been forwarded to his care from time to time for distribution.

From Col. Dunlop, to the Secretary, dated Camp Mahomedabad, 19th December, giving an account of the manner he has distributed the cotton seed from Allahabad up to Cawnpoor, enclosing a letter from Lieut. W. Stewart, stating the manner in which he intends disposing of his portion of the cotton seed, and offering his services to the Society.

From Mr. Grant Thorburn, of New York, to the address of Dr. Wallich, dated 26th July, enclosing invoice of the vegetable and cotton seeds alluded to in a former communication.

From F. Campbell, Esq., dated Midnapore, January 6th, states that sugar-cane, cotton and tobacco, are extensively cultivated in that district, and offers his services to the Society in distributing seeds and plants.

From M. P. Edgeworth, Esq. to the Secretary, dated Ambala, 4th December, advising despatch by the Steamer from Allahabad, of seven

different specimens of soils, with a request that they may be analyzed, and the results communicated to him.

From Major Gwatkin, dated Hauper, December 5th, acknowledging receipt of a parcel of seeds, (part of the collection brought out by Lord Auckland), also of the Egyptian cotton seed; mentions the total failure, with the exception of tobacco seed, of the former,—and the loss of the latter, before the plants attained maturity. Desires to have a supply of seed oats and Otaheite sugar-cane.

From W. Liddell, Esq., Secretary to the Madras Society, acknowledging receipt of the plants and seeds forwarded per *John Adam* which had arrived in excellent order.

From J. Vaupell, Esq. Secretary to the Bombay Society, acknowledging receipt of a box of Peruvian cotton seed, advises despatch of 100 Mauritius sugar-cane cuttings, per *Ernaad*,—and encloses a paper on Cochineal by a member of that body.

From Dr. Helfer, dated 8th January, acknowledging receipt of Secretary's letter, with some boxes and bags of seeds for distribution in Assam.

From James Prinsep, Esq., Secretary to the Asiatic Society, dated 2d February, forwarding for circulation among the members of the Agricultural Society, six copies of a circular received from the Royal Asiatic Society on the subject of the collection of information, regarding the natural and agricultural products of India.

From Dr. Huffnagle, dated 21st December, in reply to the Secretary's letter on the subject of procuring vegetable seeds from America; expresses his willingness to forward the wishes of the Society in this matter.

The Secretary submitted the produce of the plant 'maranta arundinacea,' brought out to this country by Lord Auckland. This plant Mr. John Bell received from the Botanic Gardens in April, and had it planted in the scorching heat of that month—it was re-transplanted in August, but under these disadvantages has given abundant returns in bulb.

Mr. Bell also laid before the meeting the produce of a few slips of real *West India Ginger*, received from Mr. Hodgkinson on the 2nd February, 1836, (vide proceedings 16th February, 1836.) The returns are abundant, and it is hoped that this root, so superior to the best ginger cultivated in India, will now be extended.

These plants have been handed to Dr. Wallich, for the purpose of being planted in the Society's nursery.

The Secretary informed the meeting that, with the concurrence of the Committee, H. Walters, Esq. J. P. Grant, Esq. and Baboo Dwarkanath Tagore, he had forwarded to Government a series of Agricultural and Statistical Queries, with a solicitation that Government would be pleased to sanction and countenance their circulation, as proposed by Mr. Walters in his paper read at a former meeting. A copy of these queries has been forwarded this day to the several editors, who, by giving them a place in their columns, will be doing a service to the Society at large.

The thanks of the meeting were ordered for the foregoing presentations and communications.

JOHN BELL,
Secretary.

Calcutta, Town Hall, Wednesday, 8th February, 1837

P. S.—Read a note from J. C. Marshman, Esq. laying before the Society, 2 copies of Vol. III. Society's Transactions, complete, with a memo. of the cost of publication amounting to Rs. 736 12 0.

Resolved that Mr. Marshman's bill be passed, and that the thanks of the Society be offered to Mr. Marshman for his indefatigable exertions in getting the volume out so soon.

Calcutta, Town Hall, March 8th, 1837.

A General Meeting of this Society was held at the Town Hall this morning, at half past 9 o'clock.

Present.—N. Wallich, M. D., V. P., in the Chair.

The Hon'ble Col. Rehling; W. Storm, Esq.; Capt. Leach; G. A. Prinsep, Esq.; A. Colvin, Esq.; J. C. Wilson, Esq.; D. B. Syers, Esq.; C. K. Robison, Esq.; W. Speir, Esq.; H. Cowie, Esq.; John Allan. Esq.; M. Staunton, Esq.; H. M. Low, Esq.; Archibald Grant, Esq.; J. W. Masters, Esq.; D. Hare, Esq.; G. T. F. Speed, Esq.; C. Hutchins, Esq., and John Bell, Esq.

Visitor.—Captain Carter.

The proceedings of the last Meeting were read and confirmed.

The following gentlemen proposed last month, were duly elected by ballot, viz.:

J. F. Cathcart, Esq., C. S.; Jas. Hills, Esq., Senior; Jas. Hills, Esq., Junior; G. S. Hills, Esq.; Frederick Maclagan, Esq.; Nath. Alexander, Esq.; W. Speir, Esq.; Baboo Madhub Dutt; Dr. G. N. Cheek; M. Bignell, Esq.; G. Cheap, Esq., C. S.; Dr. O'Dwyer; Capt. Lysaght; W. H. Macnaghten, Esq., and Lieut. Hannyngton.

The following gentlemen were proposed, viz.:

Proposed by the Secretary, seconded by the Chairman; That with reference to the zealous efforts made by Colonel J. Colvin, in introducing the American cotton seed and Otaheite sugar-cane into Upper India, and to the great interest taken by that gentleman for many years in the proceedings of this Society, up to the moment of his departure for England, that gentleman be elected an Honorary Member of the Agricultural and Horticultural Society of India.

Mr. C. K. Robison was quite ready to support any proposal that would do honour to Colonel Colvin, but objected to the above motion, as irregular, Colonel Colvin being still a member of the Society; and after some discussion, as to the power of the Society to elect honorary Members thus situated, Mr. Robison consented to the original motion with the following addition—"and that as a further mark of the great respect in which Col. Colvin's services are held, that *the* gold medal be presented to him."

Resolved,—That the question be finally settled at the next General Meeting.

Some members thought that the proposal either in its original, or subsequent form, was not in accordance with the rules of the Society; although the Chairman contended that there was a precedent as regarded Mr. Bell's motion in the case of Sir Robert Colquhoun, while there was no provision made for the award of gold medals. The honour of being elected an honorary member—or to wear a gold medal, or both, is therefore a subject for the consideration of members before the next Meeting.

Ordinary Members Proposed.

1. His Excellency Monsieur Bedier, Governor of Chandernagore, proposed by Sir Edward Ryan, seconded by Dr. Wallich.

2. Captain Carter, 73d Regiment, proposed by C. K. Robison, Esq. seconded by Dr. Wallich.

3. W. Jackson, Esq., proposed by H. M. Low, Esq., seconded by Dr. Wallich.

4. D. Pringle, Esq. C. S., proposed by H. Walters, Esq., seconded by W. Storm, Esq.

5. A. Grote, Esq. C. S., proposed by H. Walters, Esq., seconded by W. Storm, Esq.

6. Dr. Furnell, proposed by H. Walters, Esq., seconded by W. Storm, Esq.

7. J. H. Crawford, Esq., proposed by H. Walters, Esq., seconded by W. Storm, Esq.

8. George Taylor, Esq., proposed by John Allan, Esq., seconded by W. Storm, Esq.

9. G. U. Yule, Esq., proposed by John Allan, Esq., seconded by W. Storm, Esq.

10. W. Hickey, Esq., proposed by John Allan, Esq., seconded by W. Storm, Esq.

11. W. F. Fraser, Esq., proposed by John Allan, Esq., seconded by W. Storm, Esq.

12. T. A. Pitkin, Esq., proposed by D. McPherson, Esq., seconded by W. Storm, Esq.

13. R. S. Crawford, Esq. proposed by Mr. Bell, seconded by W. Storm, Esq.

14. Kenneth Mackenzie, Esq., proposed by Mr. Bell, seconded by W. Storm, Esq.

15. T. H. Gardiner, Esq., proposed by Mr. Bell, seconded by W. Storm, Esq.

16. C. Brownlow, Esq., proposed by Dr. Wallich, seconded by Mr. Bell.

17. A. Harris, Esq., proposed by W. Earle, Esq., seconded by Mr. Bell.

18. A. C. Bidwell, Esq. C. S., proposed by J. P. Grant, Esq. seconded by Mr. Bell.

19. Dr. Drummond, proposed by Dr. Strong, seconded by Dr. Wallich.

20. W. Ainslie, Esq., proposed by Alexander Colvin, Esq., seconded by J. C. Wilson, Esq.

21. The Rev. James Charles, proposed by J. C. Wilson, Esq., seconded by A. Colvin, Esq.

22. Charles Dearie, Esq., proposed by Captain Leach, seconded by C. Hutchins, Esq.

23. W. W. Kettlewell, Esq., proposed by C. Hutchins, Esq., seconded by Captain Leach.

With reference to the motion of the Rev. Mr. Boaz, which, by a resolution passed at the last meeting, was handed over to the Committee of Papers for further consideration, the Secretary drew attention to a Report, signed by the President and Members of the Committee, to the effect, that they could not at present recommend the adoption of Mr. Boaz's proposition. After the report was read which called forth much discussion, it was proposed by Mr. C. K. Robison, seconded by Mr. Archibald Grant, that this report lay on the table, for the consideration of members, to be finally settled at next meeting.

Two boxes of bulbs purchased from Mr. Arnold, through a resolution to that effect last month, were placed on the table. As the quantity was small the Secretary had reserved distribution, until authorized by the Society, and it was resolved, that such members as wished, might help themselves, and that the remainder be given over to Dr. Wallich for propagation in the Society's nursery.

The Secretary informed the meeting that he had sent some samples of Colonel Colvin's acclimated Upland Georgia cotton to gentlemen, and would proceed to read the reports of Dr. Speir and Mr. Willis, who had kindly taken the trouble to examine the staple. As Mr. Willis's report had that moment been received, he would give Dr. Speir's views on this interesting subject first.

From W. Speir, Esq., to the Secretary, dated the 6th March, forwarding a report by that gentleman, upon a sample of the bale of acclimated Upland Georgia cotton, grown by Colonel Colvin, and presented at the last meeting.

Dr. Speir says, "I find the greatest part to be of considerably longer staple than our best native cotton; but there are also a number of pods of which the staple is very short. On mentioning this to Colonel Colvin, he informed me, that the people employed to collect this parcel had gathered along with it the produce of some plants of country cotton."

"Upon the present sample, I shall merely remark that the staple, with the exception above mentioned, is equal to the American in length and also in fineness, but has lost a little in strength." "Colonel Colvin states, that it was grown upon a sandy soil in Purnea, *which was useless for every other purpose*, and that the quantity produced is equal to that of the native sorts."

The sample upon which Dr. Speir reports, is the produce of the fifth year's crops from seed originally imported from America, and he thinks that any deterioration which may have taken place, is at least not very rapid, since in the present instance it is after five years, 30 per cent. superior to that of the country, and will, it is to be presumed, maintain its superiority for some years to come.

Upon the whole, Dr. Speir's report is highly encouraging, to those who have time to attend to cultivating cotton themselves.

From Joseph Willis, Esq., to the Secretary, dated (this morning), on the same subject.

Mr. Willis offers his opinion, under great disadvantages, being left to find out the origin, and general history of the sample before him, but he pronounces it Upland Georgia, inferior to the best and better descriptions of North America Upland Georgia. His general premises accord remarkably with the opinion expressed by Dr. Speirs, and he thinks that it would sell for 20 to 25 per cent. more in England than the cottons common to the Upper Provinces.

From J. Thomason, Esq., to the Secretary, dated Azimgurh, February 3d, enquiring for the sugar-cane, a supply of which he had been led to expect from Calcutta; intimates having received supplies of the Otaheite cane from Major Sleeman's plantation at Jubbulpore, and from the Agricultural Society of Lucknow. Mr. T. adds, "the former was much larger, thicker and finer than the latter," and that both dispatches reached Azimghur in a pretty good state.

That the Agricultural prospects of that district were superb at the date of his letter.

From Major Honeywood to the Secretary, dated London, October 8, 1836, advising his arrival in England, and of having delivered over to his Agents, Messrs. Crawford, Colvin and Co., several copies of the 2nd Volume of the Society's Transactions, which he had kindly taken charge of, and that the parcels had been forwarded to their respective addresses by that firm on the same day.

Major H. solicits a supply of fresh seeds from the Himalaya mountains, especially of forest trees, and tenders his best services to the Society in England.

From Dr. James Anderson, Secretary to the Beerbhoom Society, dated 10th February, applying for seed and plants; mentions, that the chief food of the hill-people in that district is Indian corn, and requests a supply of the foreign Maize and Joomla Paddy. Dr. A. adds, that the indigenous maize produces only one small and very inferior ear.

Memorandum.—The Secretary had despatched some seeds including some Himalaya paddy and American maize, promising more on the receipt of a supply expected from the United States.

From R. Lowther, Esq., to the Secretary, dated Allahabad, Feb. 7th, acknowledging receipt of Secretary's letter of the 25th Oct. and consenting to hold his services at the Society's disposal, should he remain at that station. Mr. Lowther mentions having received charge of all the remaining cotton seed from Capt. Watt, on the departure of the latter from Allahabad, of which Mr. Lowther had forwarded one bag to Dr. Stevenson at Lucknow, who had promised to distribute it. Mr. Lowther, intimates his intention to forward, a small supply of Sandoway tobacco seed, the produce of his own garden.* The crop had turned out very fine, the seed plants being 7 and 8 feet high. Mr. Lowther accompanies his communication with a paper of fly powder, for destroying insects on young plants, and affords some useful hints on the best method of cultivating strawberries.

From the same to the same, dated Feb. 22d, stating, that Mr. Turner, the Commissioner of Revenue, had relieved him of all the cotton seed, with an intention of distributing it through the Tusseeldars, between Al-

* This seed has been since received, and is now at the service of applicants.

lahabad and Cawnpore, with injunctions that the seed is to be given to those only who are likely to give it a fair trial.

Mr. Lowther promises a further supply of tobacco seed, and expresses his willingness to meet the wishes of the Society for the establishment of a garden at that station.

Memorandum.—Col. Colvin, favoured the Secretary with the perusal of a letter from Mr. Lowther, to the same effect. Mr. Lowther proposes to call a meeting as soon as he is put in possession of an outline of what is desired.

From H. T. Prinsep, Esq., Secretary to Government, dated the 8th February, in reply to Secretary's letter of the 3d idem, in reference to the transmission of queries on subjects of an Agricultural nature to residents in the interior; states, that the Governor of Bengal participates in the objects of the Society, and that communications on such subjects may be circulated free of postage.

Memorandum.—This letter with the Society's, to which it is an answer, and the queries therein referred to, have been printed, and are now ready for circulation.

From Dr. Wallich to the Secretary, dated Feb. 17th, forwarding some silk worm's eggs, received from Mr. Edgeworth of Loodiana at the request of Capt. Wade. Mr. Edgeworth does not state what sort of silk worm it is or whence derived. The Secretary on opening the paper, found many of the eggs hatched, and with the concurrence of Dr. Wallich, he is now rearing them on the full grown mulberry leaf. The eggs are altogether different from some he received lately in Bengal for the purpose of sending to Mr. Blundell at Moulmein, and these being in the same state, Mr. Bell was obliged to adopt the same course with them. They are now arrived at the stage of cocooning, in which state the Secretary intends forwarding them in perforated boxes, so that Mr. Blundell may receive either a colony of moths, or their eggs.

From Robert Cole, Esq., Secretary, Madras Literary Society, dated 7th February, requesting a complete series of the Society's Transactions, in return for which he offers to send a copy of their journal.

Memorandum.—The Secretary had complied with Mr. Cole's request, availing himself of an opportunity which presented, to forward by Dr.

Huffnagle, copies to the Madras and Bangalore Agricultural Societies also.

From M. C. Crane, Esq., dated 21st February, forwarding specimens of the Pernambuco and Bourbon cotton, grown at Singapore.

From Major W. H. Sleeman, General Superintendent, Mussooree, dated February 11th. In reply to the Secretary's letter of the 23rd January, with enclosures on the subject of transmitting sugar-cane to the Collector of Ahmednuggur, states, that the correspondence has been forwarded to Lieutenant Brown, in charge of the Jubbulpore plantation, and expresses his willingness to meet the wishes of the Society on this or any other occasion.

In continuation of a former letter, gives an account of two different kinds of bamboo, notices the circumstances, and suggests a query as to the effect of lightning on the growth of the bamboo.

From D. Macleod, Esq., of Seonee, to the Secretary, dated February 9th, seeking information, regarding Tussur silk, which is manufactured in that district; requesting to be informed what may be considered the value of two species of country cotton termed "munnoca," and "deo cupas;" stating they can both be cultivated to any extent in that part of the country, and offering to send down specimens, if required. Noticing an advantage possessed by the Indian agriculturist, in being able to sow the same description of crops from year to year, without the application of manure.

From John Donald, Esq., of Bareilly, dated February 11th, requesting to have some varieties of cotton and tobacco seeds for trial in his district.

From D. B. Syers, Esq., to the Secretary, dated February 28th, presenting to the Society, 16 maunds of fresh cotton seed for distribution in the Mofussil.

From Major W. H. Sleeman, to the Secretary, dated Dehra, February 20th, stating that by a letter from Lieutenant Charles Brown, at Jubbulpore, to Lieut. Kirke, some of the Otaheite cane, at the Jubbulpore plantation this season, weighed eight seers each, or 16 lbs., and measured nine cubits; clearly demonstrating that the canes have not deteriorated, for, adds Major Sleeman, "I do not believe that the canes of the plantation from which the original stock was taken by me in January, 1827, weighed more."

From John Allan, Esq., dated also this morning, an interesting extract from a letter of a gentleman at Dundee, on the mode of treating flax, promising further information on the same subject.

From R. S. Thompson, Esq., forwarding extract of a letter from the letter of Mr. Clunie, of Rio Janeiro, soliciting a supply of *East India* sugar-cane of sorts.

The thanks of the Meeting were ordered for all the foregoing communications.

JOHN BELL,
Secretary.

Calcutta, Town Hall, 12*th April,* 1837.

A General Meeting of this Society was held in the Town Hall this morning, Wednesday, the 12th April, 1837.

Present.

The Honourable Sir E. Ryan, Kt. in the Chair.

The Honourable Col. Rehling.	W. Storm, Esq.
Dr. Wallich,	G. T. F. Speed, Esq.
M. Staunton, Esq.	D. W. Speed, Esq.
A. Grant, Esq.	Rev. Mr. Boaz.
H. Walters, Esq.	A. Dobbs, Esq.
J. W. Masters, Esq.	C. K. Robison, Esq.
J. C. Wilson, Esq.	G. A. Prinsep, Esq.
Colonel Caulfield,	John Bell, Esq.

Visitor.

C. Brownlow, Esq.

The proceedings of the last meeting were read and confirmed.

The following gentlemen proposed at last meeting, were duly elected ordinary members by ballot, viz.

His Excellency Mons. Bedier, Governor of Chandernagore.

Captain Carter, W. Jackson, Esq., D. Pringle, Esq., A. Grote,

Esq., Dr. Furnell, J. H. Crawford, Esq., George Taylor, Esq., J. W. Yule, Esq., W. Hickey, Esq., W. T. Fraser, Esq. T. A. Pilkin, Esq., R. S. Crawford, Esq., Kenneth Mackenzie, Esq., T. H. Gardener, Esq., C. Brownlow, Esq., A. Harris, Esq., A. C. Bidwell, Esq., Dr. Drummond, W. Ainslie, Esq., the Rev. James Charles, Charles Dearie, Esq., W. W. Kettlewell, Esq.

The proposal of the Secretary, to elect Colonel Colvin an honorary Member of this Society, which produced so much discussion at last meeting, was again brought forward and the question being put to the vote (only one member present, Mr. J. W. Masters, objecting) the original motion was carried.

Honorary Member.

Lieutenant-Colonel John Colvin.

The following gentlemen were proposed, viz. Col. D. Macleod, (Engineers) proposed by the Secretary, seconded by C. K. Robison, Esq.

M. M. Manuk, Esq., proposed by the Secretary, seconded by Dr. Wallich.

Major J. A. Moore, (Hyderabad) proposed by the President, seconded by Dr. Wallich.

J. M. Hill, Esq., (Tirhoot) proposed by John Allan, Esq., seconded by W. Storm, Esq.

D. Gibson, Esq., (Malta) proposed by W. Storm, Esq., seconded by John Allan, Esq.

Proposed by H. Walters, Esq., seconded by the Secretary.

J. P. Wise, and G. D. Glass, Esqrs. (Dacca); Jas. Grant, Esq., C. S., T. Young, Esq., C. S., J. W. Alexander, Esq., C. S., Kazee Mahomed Alee, Principal Sudder Ameen, Tipperah.

The President proceeded to business by reading a report of the Committee of Papers, which embraced a point connected with the subject of the re-electing members who had failed to pay up their arrears of subscription to the Society.

Resolved,—That no member, who shall hereafter be struck off the list of the Society for the non-payment of arrears of subscription, shall be elected until such arrears of subscription are discharged.

With reference to a motion brought forward by the Rev. Mr. Boaz in

February last, which had been submitted to the Committee of Papers for their consideration and report, which report was unfavourable to offering a premium for an Horticultural Calendar, on the grounds, that experience and materials were wanting for the production of such a work at present. Mr. Walters proposed as an amendment, seconded by Mr. Robison, and it was,

Resolved—1st. That a premium of 2,000 Rs. be offered for the best work on Indian Agriculture in all its branches, founded on experience in the country, to be presented to the Society on or before the 1st May, 1840.

Resolved—2nd. That a premium of 1,000 Rs. be offered for the best work on the Horticulture of Bengal, to be presented to the Society on, or before the 1st May, 1840.

Resolved—3rd. That a premium of 1,000 Rs. be offered for the best work on the Horticulture of the Western Provinces, to be presented to the Society on, or before the 1st May, 1840.

Resolved—4th. That this Society reserves to itself the right of refusing to grant any of the above premiums, if the works on the above subjects are not such as it approves.

Resolved—5th. That the Society do invest in Government Securities the sum of Rs. 4,000 for the payment of the above premiums.

Resolved—6th. That the authors who may receive any of the above premiums, shall within 6 months after the receipt thereof, publish the Treatises to which such Premiums shall have been awarded, or the Society shall have the option of publishing, in case the authors shall neglect to do so within the time above prescribed.

Resolved—7th. That the Society do advertize in all the public Journals, four times in each year the propesed Premiums.

Proposed by Mr. Walters, seconded by Sir E. Ryan and *Resolved*—That Gold and Silver Medals be awarded annually to the producers of the best samples of the staple products of British India, under such conditions and arrangements as may be determined on by a Committee appointed for that purpose.

Proposed by the President, that the following Gentlemen do form a Committee to arrange details and plan the Medals, &c. viz. Mr. Walters, Mr. G. Prinsep, and Mr. Robison.

The following propositions were submitted by the Committee of Papers and carried, nem. con.

Resolved—1st. That notice of motion be given in all questions relating to finance, at a General Meeting preceding that on which the subject is to be disposed of, in order that members who take an interest in the question, may have an opportunity of signifying their assent or objection either verbally, or in writing; and that all such notices be recorded in the Journals along with the other proceedings.

Resolved—2nd. That motions of which previous notice has been given, take precedence of all others.

Resolved—3rd. That the same rules are applicable to all motions involving points of importance, and that no Resolution be passed at the same time that it is brought forward, unless the case be urgent.

Resolved—4th. That the above resolutions be added to the standing rules of the Society.

Resolved—That the rules of the Society be revised by the Committee of Papers, and brought forward in an amended form at the next General Meeting, to be confirmed.

The Secretary read a Report on a former motion of W. Storm, Esq. on the practicability of improving the cattle and the sheep of India, by importing foreign stocks.

Resolved—That the Report be laid on the table for the consideration and suggestions of members.

From Mr. J. W. Grant, a small specimen of the "Nurma or Chundera" Cotton, from a plant of the second year's standing.

From Mr. C. R. Bell, a small sample of cotton and seed, as plucked from the plant in the original wild state, growing on the island of Orestonga, (one of the South Sea islands), by the 1st Lieut. of H. M.'s Brig *Zebra*, who presented it to Captain Symers of the *Caledonia*.

From Mr. R. Homfray, two apricots from his garden at Barripore.

From the same, a dried specimen of what he terms the "Cappilaire" plant.

From the Honourable Mr. Melville, a box of seed of the Teak Tree for distribution.

From Major Moore, of Hyderabad, a tin box containing samples of the potatoe grown there, presented by Sir E. Ryan.

From Colonel Beatson, a sample of coffee grown in his garden, and "a complete treaties on the culture of Tobacco."

From Mr. R. Lowther, two pint bottles of Sandoway Tobacoo seed, produced in his garden at Allahabad, for distribution.

From the Secretary, ten quart bottles of Tobacco seed, part of the produce of a very small supply sent round in a letter to Dr. Wallich, by Dr. Wight of Madras, and grown in Mr. Bell's Garden.

Dr. Wight does not know the name of this Tobacco, but describes it, as very superior. It was sown by Mr. B. when presented to him by Dr. Wallich in October last, and the plants are still in full blossom, averaging four feet in height. The quantity of seed now presented to the Society, is not above one-fourth of what may be expected, when the pods have all ripened. This affords an opportunity to parties to provide themselves amply with fresh Tobacco seed of a superior kind.

A plant in full bearing was submitted for the inspection of members.

From Mr. J. J. Dixwell, of Boston, dated 19th November, 1836, in accordance with a request from the Secretary, enclosing bill of lading for a barrel and a box of American Maize in husk, the first containing the large "*Canada*" kind,* the latter, containing the "*common yellow*" kind.†

Mr. Dixwell promises to send a further supply of two more varieties by the next opportunity, and to follow these by regular annual shipments, until this superior corn has taken root in India.

From Mr. D. W. H. Speed.

2 picked samples of Maize from Jaunpoor seed.

2 ditto Red Desee ditto.

2 ditto yellow ditto ditto, all grown at his garden at Allipore.

Mem.—Members and others interested in the progress of this Society, are solicited to favour the Secretary with samples of the different products of India, which will be carefully preserved.

From Mr. Vaupell, Secretary to the Bombay Society, dated 28th February, acknowledging the receipt of Mr. Bell's letter of the 2nd January, and of the cotton seed therein referred to.

* Produced somewhere in the Middle States of the Union.

† Cultivated in the vicinity of Boston.

Stating that the Pernambuco cotton seed had proved a failure, but that a plantation of the *Egyptian* at Ahmednuggur is flourishing.

Forwards a pamphlet issued by the Sub-Committee, in reference to furthering the objects of the Committee of Agriculture and Trade, recently formed as a distinct Branch of the Royal Asiatic Society of Great Britain.

Mentions his retirement from the office of Secretary to the Bombay Society.

From Capt. R. Jenkins, dated Assam 12th March, requesting a supply of the New Holland brown corn, and recommending that various experiments be made with the indigenous cottons, which are in his opinion susceptible of very great improvement.

From Mr. C. Lyall, dated 30th March, enclosing extract of a letter to the address of Messrs. Lyall, Matheson and Co., from Mr. A. H. Palmer, of New York, dated 27th October, 1836, respecting the manufacture of oil from cotton seed, which had been turned to good account in America, and had attracted the notice of the Pasha of Egypt, who had sent an order to the States to have the machinery of a cotton seed oil mill forwarded to his dominions.

From Mr. C. P. Holloway, of Singapore, dated 15th February, forwarding a specimen of Pernambuco cotton, cultivated in his grounds in that Island.

From Mr. Secretary W. H. Macnaghten, dated 20th February, forwarding by desire of the Governor General in Council, a paper drawn up by Dr. A. Campbell, on the Agriculture of Nepaul.

Mem.—This paper has been forwarded to the press for publication, by directions from the Committee of Papers.

From R. Lowther, Esq. dated 14th March, requesting a further supply of cotton seed to meet fresh applications. Intimates his appointment as Commissioner of Revenue at Allahabad, and offers a continuation of his assistance.

Mem.—The Secretary had despatched a supply of cotton seed accordingly.

From Mr. W. Liddell, Secretary to the Madras Society, dated 9th March, acknowledging the receipt of cotton seed forwarded by the Se-

cretary on the "*Thetis*." Advises having purchased Capt. Dalrymple's Plough for this Society.

States that he had received some potatoes grown at Vellore equal to any reared above the Ghats, and encloses a paper on the mode of cultivating them, by Capt. Awdry. Returns thanks for the Patna vegetable seeds, furnished through this Society, by Mr. Duhan, which had proved *very bad*.

From Dr. Davenport, dated Comillah, 23rd March, intimating the formation of a Branch Agricultural Society at that station, and requesting a supply of seeds, &c.

From Mr. H. Mathews, of Dearie, dated 26th March, received through Mr. Secretary Prinsep, enclosing a list of replies, (with reference to the District of Shahabad,) to the queries contained in the Society's circular of the 8th February last.

From Rajah Kaleekrishna, dated 25th March, proffering his services as the medium of communication between the Society and the Committee of Agriculture and Trade in Great Britain.

From Lieut. C. Brown, dated Jubbulpore, 9th March, in reply to the Secretary's letter of the 24th February. He states that a quantity of Otaheite sugar-cane was forwarded in December last, to the Collector of Ahmednuggur on account of the Bombay Government, and in reply to the solicitation of the Secretary, on behalf of this Society, to have a supply for the Calcutta Nursery, expresses his willingness to meet the request, in the ensuing season.

From Mr. F. Campbell, of Midnapore, acknowledging the receipt of cotton and tobacco seed and asking for sugar-cane.

From Mr. R. J. Homfray, dated Barripore, 6th March, furnishing a short account of the wild silk worm, or "Tussuck Pokah."

From the Honourable Mr. Melville, suggesting, (in reference to the teak seed presented,) that the offer of a medal be made to the person who may plant the greatest number of trees in one year. Alludes to the discovery by Dr. Burt of a fine and permanent yellow dye from the teak tree leaf.

From Dr. Burt, dated 9th April, enclosing copy of a communication to the Secretary to the Asiatic Society, on further experiments made on the dyeing properties of the teak leaf.

From H. Walters, Esq., dated 10th April, presenting on the part of Lieut. Rainey, Junior Assistant in Arracan, two rice husking machines, one made of bamboo basket work, the other of wood, together with a buffalo plough ; also specimens of Arracan black and red rice.

From J. R. Colvin, Esq., dated 11th and 21st March, forwarding the 2nd and last parts of Dr. McClelland's Report on Assam, with coloured sketches.

Mem.—These have since passed through the Committee of Papers, and are now in the Press.

From Joseph Willis, Esq., dated 11th April, reporting upon two specimens of cotton, presented by Mr. Crane at the last meeting, grown at Singapore, from seed originally Pernambuco and Bourbon.

The Pernambuco kind is described by Mr. Willis, as "decidedly of most inferior quality, being coarse, harsh, short in staple and very weak."

Of the Bourbon, Mr. Willis speaks more favourably. "It is fine and silky, and of pretty good strength of staple; yet not quite so strong as it ought to be ; its complexion is good also." Mr. Willis values this cotton, with reference to the latest advices from Liverpool, at about 9*d*. per lb. The seed is represented to be smaller than usual in this description of cotton, but does not consider this as an unvariable criterion, in contrasting the quality of the wool, and very appositely asks, "how is it that we sometimes find inedible and other fruits improve in either the flavour or the volume of pulpy and fibrous matter, when the seed itself becomes much diminished under improved cultivation."

From the Secretary, presenting some Guinea grass seed and brown corn ; also several sorts of peas and beans, all from Cape seed, and gleaned after having plentifully supplied the table.

Mem.—It is probable that in a short time, the Society may render itself independent of foreign aid, by raising in its Nursery supplies of all sorts of garden seeds, at one third the expense at which they are now imported.

From Capt. Stacy, dated Allyghur, 2nd March, with a sample of Pernambuco cotton.

From Dr. Helfer to Sir E. Ryan, dated Moulmein, 1st March, giving a very favourable report on the experiments now making by Mr. Bell in Pernambuco cotton, and requesting to be supplied with good tobacco seed, which Dr. Helfer thinks will answer admirably.

From W. Blundell, Esq. to Sir E. Ryan, dated 28th February, stating that the American cotton seed sent from the *Society had failed.*

Mem.—All the same seed tried here has vegetated most freely. Dr. Helfer has discovered that a caterpillar abounds in the cashoonut trees, which yields a good strong description of silk.

From Dr. Helfer to Dr. Wallich, soliciting a supply of tobacco seed.

The thanks of the Society were ordered for the above contributions and communications.

JOHN BELL.

Secretary.

Calcutta, Town Hall, May 10th, 1837.

A General Meeting of the Society was held at the Town Hall this morning, May 10, at ½ past 9 o'clock.

Present.

The Honourable Sir E. Ryan, President, in the Chair.

The Honourable Col. Rehling,	The Nawaub Tohowe-jung,
Dr. Wallich,	Capt. Leach,
John Allan, Esq.	A. Grant, Esq.
Wm. Storm, Esq.	C. Trebeck, Esq.
C. K. Robison, Esq.	G. A. Prinsep, Esq.
D. Hare, Esq.	A. G. Harris, Esq.
J. S. Stopford, Esq.	W. H. Hamerton, Esq.
Dr. Huffnagle,	Dr. Strong,
N. Alexander, Esq.	C. Brownlow, Esq.
M. A. Bignell, Esq.	G. T. Speed, Esq.
J. W. Masters, Esq.	and
E. Stirling, Esq. C. S.	John Bell, Esq.

The Proceedings of last meeting were read and confirmed.

The following gentlemen, proposed at last meeting, were duly elected members of the Society, viz.

Col. D. Macleod, (Engineers.)	J. P. Wise, Esq.
Major J. A. Moore, Hydrabad.	J. W. Alexander, Esq.
M. M. Manuk, Esq.	T. Young, Esq. C. S.
Jas. Grant, Esq. C. S.	D. Gibson, Esq.
J. M. Hill, Esq.	and
G. D. Glass, Esq.	Kazee Mahomed Alli.

The following gentlemen were proposed, viz.

Sir B. Malkin, proposed by Sir E. Ryan, and seconded by Dr. Wallich.

Francis Robinson, Esq. C. S. proposed by M. A. Bignell, Esq. and seconded by Dr. Wallich.

Samuel Oram, Esq. of Hanskallee, proposed by William Storm, Esq. and seconded by John Bell, Esq.

A. Oram, Esq. of Nuddeah, proposed by W. Hickey, Esq. and seconded by J. Allan, Esq.

Edward S. Hodges, Esq. and Henry Graham, Esq. of Khalbolya, Kishnaghur, proposed by William Storm, Esq. and seconded by John Bell, Esq.

W. A. Shaw, Esq. of Bhaugulpore, proposed by John Allan, Esq. and seconded by W. Storm, Esq.

N. B. E. Baillie, Esq. proposed by William Storm, Esq. and seconded by J. Allan, Esq.

The Secretary read the report of a Sub-Committee, on the question of awarding medals "to the producers of the best samples of the staple products of British India." After some slight alterations suggested by the Chairman, on the motion of John Allan, Esq. seconded by Dr. Strong,

Resolved,—That the report be approved and adopted, and that the conditions be publicly announced.

The gold medal is to be awarded for the best samples of Raw Sugar, Cotton from foreign seed, Silk and Tobacco from foreign seed.

The silver medal is to be awarded for the second best samples of these products.

A report was brought up from the Agricultural Committee, in reference to the suggestions offered by them at the last General Meeting, on Mr. Storm's motion, to improve the breed of Cattle and Sheep in India generally, and particularly in Bengal.

The report which was read at the last Meeting, was ordered to lay on the table, and although on a subject of vital importance to the Agricultural and Commercial interests of India, it had not been called for by a single member.

Mr. A. Grant proposed, that it should be ordered to have a further respite of two months, as objections were taken to the site proposed, on the grounds of inconvenience and dampness, which by a member present, was thought an insuperable objection to the successful developement of a superior breed. This objection was met by Mr. N. Alexander, who stated that the best horse in India had been bred in Bengal.

The Committee having left the computation of expense, as an after-consideration, their present view being to arrest the attention of the Society to the utility of the measure, the President proposed, that the reports be re-submitted for further consideration, and that the following gentlemen be requested to join the original Committee, viz. Messrs. Walters, N. Alexander, Robison and Dr. Huffnagle, with liberty to add to their number.

Sir E. Ryan stated, that he had received a letter from Sir H. Fane, in reference to an application made to Mr. C. Poulett Thompson, based on a resolution of the 10th February, 1836, to insure a regular supply of Cotton seed from America. The importance of the subject is duly recognized by the lively interest which Mr. Thompson has diffused among the influential merchants and others in England, who have cordially co-operated with the Horticultural authorities, and the Society is led to expect shortly the first despatch of seed, viâ England, thence by the overland couriers, and another direct from Boston or New York.

Dr. Strong proposed, and was warmly seconded by all present, that the special thanks of the Society be offered to Mr. Thompson for the great interest and trouble he has taken in the matter.

Mr. W. C. Crane, submitted some very fine specimens of Cotton, grown at Singapore, from Upland Georgia seed, which he had received from this Society in *October last*, and from seed received from *Manilla*. A pod of the latter was, without exception, the most perfect, beautiful and largest, ever grown or seen in India. Mr. Crane *terms* it "*Manilla Cotton*."

Another beautiful specimen of cotton was exhibited by Mr. G. Prin-

sep, grown in the Sunderbunds, without care, from seed (Peruvian) presented to this Society by Mr. Jas. Crooke on the 8th June last. The fibre of this cotton is long, fine and strong, and easily detached from its black seed. Mr. Prinsep had only a single plant, but is husbanding the seed, with a view to its further propagation; and there can be little doubt that the Peruvian cotton, will prove a valuable addition to our Foreign acclimated cottons.

Mr. E. Stirling exhibited some cotton in the pod, grown at Fernando Po, by a gentleman who had sent a quantity of the crop to England. This appears to be a superior kind, easily detached from the seed.

Mem.—Dr. Wallich expressed a wish to multiply this seed, by planting the few pods presented, in the Society's nursery, and received it from the Secretary for that purpose. It is probably fresh, as Mr. Stirling received it on visiting the Island in February, 1837.

The same gentleman presented some orange seeds from the Island of St. Jago, one of the Cape de Verd Islands. The fruit is described as particularly fine, and reckoned to possess greater perfection than those of the Azores.

Mr. Robison proposed, and it was resolved, to forward the seeds to Mr. Inglis, at Sylhet, who takes great interest in Horticultural pursuits. Dr. Wallich took also a few seeds for trial at the Botanical Garden.

Very fair specimens of cotton were presented, the produce of the Society's nursery, viz. "Upland Georgia" from seed sown on the 4th October, 1836, which came up on the 8th idem, and was gathered in May; "New Orleans," from seed sown on the same day, which sprung up on the 8th idem, and was gathered yesterday.

The Secretary read a letter from Mr. Millet to his address, dated 18th April, presenting six musk melons, reared in Entally, which he had distributed to several members, whose opinions were all in favour of the superior flavour of this melon, compared with any heretofore produced in Bengal. Mr. Millet had also sent specimens to other gentlemen, who reported favourably of their quality.

The Secretary had personally inspected Mr. Millet's bed of melons, which occupied about a bigah of ground, and appeared to have been very carefully cultivated; even to the necessity of purchasing water for the purpose of irrigation.

A second letter which had been drawn up by desire of the Secretary, was read, detailing the mode of culture adopted, but wanting, (as Mr. Alexander noticed, who had devoted much attention to melons,) in the most essential point, *manure.*

The meeting was unanimous in its desire to encourage such experiments; and on the motion of the President,

Resolved, That a silver medal, and two hundred rupees, be awarded to Mr. Millet, for his exertions, and with reference to the expense he had incurred in making the experiment.

A few copies of the first part of Vol. IV. Society's Transactions, were received by the Secretary, during the business of the Meeting, composed of Dr. McClelland's report on the Geology, &c. of Assam, but the superscription on the envelope and title page being incorrect, the pamphlet was ordered to be kept back until another envelope be printed.

Read a letter from Mr. Secretary W. H. Macnaghten, dated 18th April, forwarding, by desire of the Right Honourable the Governor General of India in Council, copy of further notes by Dr. Campbell on the Agriculture of Nepaul proper, together with a memorandum by that officer on the state of the arts in Nepaul.

Mem.—This paper is now in the Press.

Read a letter from Dr. Wallich, dated the 2nd instant, annexing extract of a letter from Professor Royle, dated London, 8th December, 1836, on the subject of *Caoutchouc* or Indian rubber, which has become an article of immense consumption in England; with a letter from the Secretary to the "London Caoutchouc Company," and several copies of a prospectus issued by the said Company, also a bottle of Caoutchouc, made by the natives of Para, and a wooden model of the form in which the substance is required to be made, giving instructions regarding the preparation of the India rubber, and stating that the Company have offered a reward of £50 to any person who will send them a cwt. of the article collected in our East India possessions.

Mem.—A large export of the article has already commenced at Calcutta, which clearly demonstrates, that the powerful incentive to all human action, *self-interest,* will do more for the advancement of *Commerce,* than the most costly medals that can be devised.

From James Prinsep, Esq. dated 4th May, forwarding, by desire of

the Asiatic Society of Bengal, a copy of the Caoutchouc Company's prospectus, with a duplicate of the block already adverted to.

Proposed by Mr. Bell, seconded by Mr. Storm, and resolved: That copies of this prospectus be forwarded to all branch Societies throughout India, and that the Editors of Journals be solicited to transfer the prospectus to their columns, in order that the utmost publicity be given to parties anxious to embark in the speculation.

From Capt. H. Macfarquhar, of Tavoy, dated 10th March, forwarding a specimen of Hemp, grown in his garden from a few shoots received from Col. Burney, of Ava, and desiring an opinion on its quality, &c.

From Capt. J. D. Syers, dated Cuttack, April 9th, intimating the establishment of a branch Society at that station, of which he is Secretary.

From F. Campbell, Esq. dated Midnapore, 8th May, communicating the formation of a branch Society at that station, under the joint management of Dr. O'Dwyer and Mr. Campbell.

From Mr. J. W. Masters, forwarding a paper, formerly written by him on the treatment of peach trees, with additions from subsequent experience.

From M. P. Edgeworth, Esq. dated Loodianah, 24th April, furnishing a description of a sugar mill, termed "Kulare," used in that part of the country. He speaks favourably of the Otaheite cane, and the successful vegetation of Upland Georgia cotton seed.

From Major J. A. Moore, of Hydrabad, to Sir E. Ryan, dated 7th May, forwarding a box containing three non-pareil apples, grown in his garden, which were in great perfection, as fresh as when pulled, and of flavour highly approved by the Meeting.

From Dr. Wallich, dated 6th May, presenting in the name of Dr. Wight, of Madras, a circular drawn up and printed by that gentleman, regarding the preparation and introduction on a more extended scale in India, of the Senna plant.

From the same, dated 9th May, enclosing a note to his address, from Capt. Jenkins, of Gowhatti, forwarding a sample of "Creole Rice" from seed, presented to this Society by Mr. Piddington, and of sugar manufactured at that place by Mr. Grange. The sugar is of very good quality.

From H. Walters, Esq. dated 8th May, forwarding a series of re-

plies, drawn up by the Rev. Mr. Williamson, (with reference to the Beerbhoom District) to the queries lately circulated by the Agricultural Society of India.

From W. Liddell, Esq. Secretary to the Madras Society, advising the despatch of a *plough*, which was exhibited at the Meeting, incomplete. Several members thought the sum, (100 Rs.) paid for it, exorbitant.

From Capt. Jenkins, dated Gowhatti, 7th April, to the Secretary, acknowledging the receipt of seeds, and offering some interesting remarks on grasses. Capt. Jenkins argues satisfactorily, that poverty is the chief cause of bad pasturage in India, and the effect is equally carried through every branch of Agriculture.

From W. Munro, Esq., Secretary to the Bangalore Society, dated 9th April, acknowledging the receipt of seeds, &c.

From W. Blundell, Esq., dated Moulmein, 2d April, forwarding sample of cotton, reared from Pernambuco seed, of very good quality; but Mr. Blundell thinks not sufficient in quantity to tempt cultivation on a large scale.

From Rajah Kalikrishna, presenting a sample of arhar dhal, grown in Zillah Tipperah. The Rajah is solicited to procure some of the seed.

From J. J. Dixwell, Esq. dated Boston, 15th December, 1840, stating that the second dispatch of maize, which he hoped to have forwarded by this conveyance, had not yet been received.

From His Highness Nawaub Tohowerjung, dated 28th April, presenting a specimen of cotton grown in his garden, from seed received from the Society.

From Mr. Laiten, of Shahabad, dated 19th April, undertaking to supply seed, so as to reach the Presidency in September.

From Mr. Waghorn, dated Cairo, 27th January, acknowledging the receipt of his election as an Honorary Member of this Society.

Promises to speak to the Pasha, on the subject of being permitted to send more cotton seed.

From Dr. Campbell, of Nepaul, dated April 19th, forwarding the eight original specimens of soils alluded to in his notes on the Agriculture of Nepaul.

Resolved, That Mr. J. W. Masters be requested to furnish the Society with an analysis of them.

Mr. Masters took away the soils for this purpose.

Specimens of "Lycopodium," from California, were presented by Mr. Bignell, which Dr. Wallich promised further to report upon.

A pod of Chocholate, presented by Nawaub Tohowerjung.

The thanks of the Society were ordered to be offered for all these contributions.

JOHN BELL,
Secretary.

Calcutta, Town Hall, 14*th June*, 1837.

A General Meeting of this Society was held at the Town Hall this morning, June 14, at ½ past 9 o'clock.

Present.

The Honourable Sir E. Ryan, President, in the Chair.

Dr. Wallich,	Dr. C. Huffnagle,
Wm. Storm, Esq.	M. M. Manuk, Esq.
John Allan, Esq.	G. A. Prinsep, Esq.
Dr. Corbyn,	C. Brownlow, Esq.
C. K. Robison, Esq.	Captain Carter,
Captain Leach,	Dr. W. Speir,
E. Stirling, Esq.	C. Hutchins, Esq.
A. Grant, Esq.	C. Dearie, Esq.
T. H. Gardiner, Esq.	G. F. Speed, Esq. and
J. W. Masters, Esq.	John Bell, Esq.

Visitors.

Capt. Nash, and W. S. Kelsall, Esq.

The Proceedings of the last meeting were read and confirmed.

The following gentlemen proposed at the last meeting, were duly elected members of the Society.

Sir Benj. Malkin, Kt.	W. A. Shaw, Esq.
F. Robinson, Esq. C. S.	Samuel Oram, Esq.

N. B. E. Baillie, Esq. E. S. Hodges, Esq. and
A. Oram, Esq. H. Graham, Esq.

The following gentlemen were proposed, viz.

Lieut. J. Gilmore, Eng., J. P. Mackilligin, Esq. Allan Gilmore, Esq. proposed by Wm. Storm, Esq. seconded by John Allan, Esq.

John Maclean, Esq. proposed by W. Storm, Esq. seconded by J. S. Stopford, Esq.

Minian Mackenzie, Esq. proposed by W. Storm, Esq. seconded by A. Macarthur, Esq.

Robt. Watson, Esq. proposed by W. Storm, Esq. and seconded by N. Wallich, Esq.

R. H. P. Clarke, Esq. *Offg. Magistrate and Collector of Suheswan*, J. Donald, Esq. *Bissowlie Factory via Suheswan*, proposed by the Secretary, seconded by Dr. Wallich.

W. F. Fergusson, Esq. proposed by the Secretary, seconded by Sir E. Ryan.

A. Larruletta, Esq. G. De Gorastiza, Esq. Sooksaugor, proposed by H. Walters, Esq. seconded by the Secretary.

R. B. Garrett, Esq. C. S. proposed by C. K. Robison, Esq. seconded by the Secretary.

Thos. S. Kelsall Esq. proposed by C. Dearie, Esq. seconded by Capt. Leach.

John Stewart, Esq. proposed by J. C. Wilson, Esq. seconded by A. Colvin, Esq.

The President read a report of the Committee appointed at the last general meeting of the Society, to re-consider the suggestions of a former Committee, on the best means of encouraging improvements in the breed of cattle and sheep in India.

The opinions of the Committee, on the subject of the probable expense, of maintaining an experimental breeding farm being exceedingly conflicting, the members of the old Committee deemed it prudent to concede the point for the present, and to subscribe to a resolution which, it was thought, would meet the end contemplated, that of awarding premiums and medals to the public, for the best imported Horned cattle and sheep, and that the amounts of such premiums should be adjusted, after the resolution had met the concurrence of a general meeting. The Pre-

sident proposed that the report be returned for amendment, to be again brought up at the next meeting.

Dr. Wallich proposed, with reference to the numerous interesting and important questions which have come before the Society, that *standing* Committees be appointed, to consider and report at once upon matters referred to them, by which means a more solid opinion might be given by members, who were conversant with the subject submitted, and thus rectify the inconvenience of constantly forming new Committees, which were frequently composed of gentlemen, who, although well qualified to offer an opinion on one question, would be lost in taking an erroneous view of another.

Dr. Wallich's proposal was seconded by the Chair, and by the meeting generally, but the nomination of members was left for another occasion.

Dr. Wallich reported, on behalf of the Agricultural Committee who inspected the Society's Nursery last week, that the sugar-cane plants were in a thriving condition, and that a resolution had been proposed, not to trench upon the young stock in at least 18 months, when the Society might be able to supply all applicants.

COMMUNICATIONS.

In the report of proceedings for last month, the Secretary omitted to allude to an interesting extract contained in Dr. Wallich's communication of the 9th May—from *Loudon's Gardener's Magazine* for December, 1836—page 684—*on the mode of accelerating the growth of seeds by scalding*. The extract is too long to notice here, but will probably appear in the Society's Transactions.

The following are notes from Dr. Wallich to the Secretary:—

No. 1. Dated 15th May, forwarding a note from Captain Jenkins, together with specimens of the Assam Red Bean.

No. 2. Dated 25th May, acknowledging the receipt of sugar-canes, sent to the Secretary, by Dr. Montgomerie, of Singapore.

No. 3. Dated 26th May, enclosing a report by Mr. Masters, on the condition of the sugar-cane from Singapore, which have arrived in excellent condition,—some packed in dry sand, and some simply wisped round with straw. They are very fine canes, and resemble, (if they are not). the Otaheite cane.

No. 4. Dated 13th June, presenting to the Society, in the name of Dr. R. Wight, of Madras, some printed copies of a paper drawn up by that gentleman on the cultivation of cotton in the Peninsula.

No. 5. Dated 13th June, forwarding for presentation to the Society, in the name of Captain Jenkins, of Assam, specimens of Mazanhurry moojah, and of Area floss Silk, and annexing extract of a letter from that gentleman, giving some information regarding these samples. Captain Jenkins suggested, that if any means could be adopted to reel the silk of the wild area worm, which is now wound off by the hand, it might become a valuable acquisition to our best exportable resources. With a view to attract attention to the subject, Captain Jenkins offers to place 500 rupees at the disposal of the Society, for premium or premiums, to encourage expériments—and suggested, that the Society should set aside 5,000 rupees towards the same object.

Proposed by the President, and resolved, that the Secretary be requested to convey the Society's best thanks for Captain Jenkins's liberal offer—and to accept it;—and that the matter be referred for consideration, to a Committee consisting of Dr. Spier, W. Storm, Esq. G. T. F. Speed, Esq. C. K. Robison, Esq. and Professor O'Shaughnessy.

No. 6. Dated 13th June, describing the curious moss of California presented at the last meeting by Mr. Bignell, as approaching nearly to the species of Lycopodium involvens and pulvinatum having the property of beautifully expanding, when put into water.

Dr. Wallich has retained one piece for further examination.

From Ross D. Mangles, Esq. dated 16th May, stating in reply to the Secretary's letter of the 29th April, that instructions have been issued to the Commissioners of Circuit, to cause to be forwarded to the Society's office, monthly returns of the prices of grain, in their respective districts.

From Dr. A. Campbell, of Nepaul, of dates 6th, 7th, and 10th May, acknowledging receipt of American Maize forwarded by the Secretary, and forwarding, by desire, some specimens of the Maize of Nepaul.

From Dr. Montgomerie, of Singapore, dated 17th April, forwarding per *Gaillardon*, a box and two bundles of Sugar-cane of two kinds, the produce of the Island, and requesting to be favoured with a report as to their quality and value, in reference to the Otaheite cane.

From Sir Thomas Anburey, to Sir E. Ryan, dated Saugor, Bundlekund, 23d May, forwarding some seeds of a Melon grown at a place called "Kooreapoor," (close on a small sandy stream) about 10 miles from that station.

Sir Thomas describes this melon to be decidedly superior to any he had tasted in Bengal, or in the N. W. Provinces, and having distributed the seed to several friends in Calcutta, Sir Thomas is of opinion, that with care and good management it may be established here.

From Col. D. McLeod, of Engineers, to the Secretary, dated 13th June, forwarding two small parcels of melon seed from the same source as those received by Sir E. Ryan; one parcel superscribed, "rock melon of Saugor," 2 feet 2½ inches in circumference, the other, "high flavoured melon from Saugor."

From Mr. Millet, dated 23d May, furnishing an account of the mode, &c. adopted by him in the culture of the musk melons presented at the last meeting.

N. B. Mr. Millet having fulfilled the conditions of the Society's resolution, the Secretary had paid, on receipt of this communication, 200 Rs. to Mr. Millet, and presented him on behalf of the Society, a silver medal.•

Mem.—Erratum in last month's report. The motion of the President was to reward Mr. Millet, with 160 Rs. and silver medal; but as Mr. M. had incurred an expense of 170 Rs., Mr. Storm proposed, as an amendment, seconded by Capt. Leach, that 200 Rs. be awarded, and it was resolved accordingly.

From Mr. Millet to the Secretary, dated 13th June, sending six melons of the same description from seed, which was first planted, as the last crop attained maturity, and which are certainly superior in flavour to the former.

From Capt. T. P. Cautley, Superintendent of the Doab Canal, dated 10th May, mentioning his endeavours to introduce the cultivation of superior varieties of rice along the line of the Doab Canal, by the annual distribution of fresh grain (procured from a place N. of Nahan, famed for the kind called "Bansmatti"), to all the rice villages in the neighbourhood.

Mentions having successfully introduced the Otaheite sugar-cane, which

will enable him to distribute it largely. Offers his services to advance the interests of the Society.

From the same, dated 11th May, forwarding for the opinion of the Society, a sample of Indigo, manufactured by Sergeant Pigott, an overseer on the Doab Canal.

From Major J. R. Ouseley, principal Assistant to the Commissioner of the Saugor and Nerbudda Territories, dated Camp, Baitool, Hosungabad, May 14th, in reply to the Society's circular, under date the 31st March, forwards a list of answers with reference to that part of the country, to the several questions therein contained.

From Colonel Dunlop, dated Head-Quarters Simlah, 15th May, remarking on the several varieties of fruits obtainable at Simlah, such as grapes, apricots, walnuts, &c. which are represented as tolerably good, but susceptible of great improvement by grafting and budding. Promises to collect specimens of grain and forest tree seed for the Society. Notices having seen American cotton growing at Ferozepore, on the Sutledge. States that sugar-cane is much required in that quarter. Asks for a pupply of garden seeds to reach Simlah by October or November.

From Major Garstin, dated Meerut, 21st May, presenting to the Society, for the sake of the seed, some dried raspberries of an inferior kind, the produce of this garden and requesting information as to the best method of improving the species; promising also to give the result of some experiments with artichokes, asparagus and wild strawberries.

From J. P. Marcus, Esq. Naunsagur, 29th May, presenting to the Society two bottles of the *Roosa* grass seed, with a small phial of oil distilled by him from the grass. Stating that the process for manufacturing the oil will be found in the 3d volume of the Transactions of the Medical and Physical Society of Calcutta.

Mem.—The oil being packed with the seed, was found broken on the packet being opened; but the odour would admit of its being called genuine oil.

From Captain Lysaght to H. Walters, Esq., dated Bolaram, 16th May, acknowledging receipt of garden seeds, forwarded by the Society. Forwards a pod of Simool cotton, and a sketch of, and giving information regarding, the method in practice in that part of the country of drawing water from wells.

From *the Hon.* Mr. Melville, dated Berhampore, 15th May, presenting a specimen of cotton grown at that station from Upland Georgia seed.

From the same, dated 1st June, forwarding a larger supply of the above cotton, with a specimen of the soil.

From Mr. J. W. Laidlay, dated Berhampore, 1st June, advising the establishment of an Agricultural Society at that station, and soliciting the co-operation of the Society of India.

From Mr. H. C. Hulse, Veterinary Surgeon at Muttra, dated 12th and 29th May, offering for the consideration of the Society, some remarks, based on his own experience, in the rearing of sheep, horned cattle and horses in India, and tendering his further services in furtherance of the object in view.

The Secretary was directed to pass these communications to the Cattle-improving Committee.

From E. Bentall, Esq. Magistrate and Collector of Dinagepore, tendering his services towards establishing a Branch Society at that station, and requesting the co-operation of this Society.

From Lieut. J. Hannyngton, dated Prirula, 7th June, intimating the *establishment of a new station* in the Jungle Mehal district, which seems to him well adapted for the growth of Upland Georgia cotton, requesting a supply of the seed and Otaheite cane.

From G. H. Smith, Esq. dated Mussoorie, 23d May, intimating his intention of trying experiments in the Doon with cotton, tobacco, sugar, indigo, &c.; requiring information upon the culture of these articles, and a supply of seed from the Society's stock.

From R. Lowther, Esq. dated Allahabad, 4th May, acknowledging the receipt of further supplies of cotton seed. Advises despatch of two quart bottles more of the Sandoway tobacco seed.

Mr. Lowther regrets his inability to establish a garden at present, in consequence of the high price of ground rent in the vicinity of the station.

From J. P. Marcus, Esq. dated 3rd May, (Naunsaugor) promising to furnish replies to the queries conveyed in the Society's circular, but stating his inability to form a branch Society at present, as recommended by Mr. Walters, owing to the general poverty of the Zemindars and others in that neighbourhood.

From Lieut. H. Bigge, dated Bissenath, 21st April, forwarding a paper on the destruction of several lime and orange trees in his garden by a maggot, together with two specimens of the same, and three pieces of the trees destroyed.

From Captain S. F. Hannay, dated 12th May, mentioning that the hemp forwarded by Captain Macfarquhar, of Tavoy, (alluded to in the last proceedings) is the *Shon Hemp* largely cultivated in Upper Assam, and used for making fishing-nets, for which it is well adapted from its great strength and elasticity.

From Mr. C. Villet, seedsman, Cape of Good Hope, dated 6th March, in reply to the Secretary's letter of the 20th December last, on the subject of a supply of vegetable and flower seeds, for the approaching season—states that the order was in a state of forwardness, and would be shipped by the first favourable opportunity. Explains the cause of not having sent any cauliflower seeds last year. The crop at the Cape had completely failed.

From Mr. A. Larten, dated Shahabad, 28th May, stating that the seeds required for the Madras Society will be despatched on the 8th proximo.

From J. Little, Esq. Secretary to the Agricultural and Horticultural Society at Bombay, dated 6th May, acknowledging the receipt of the Secretary's letter of 7th March, and of the American cotton seed, which had been widely distributed over the cotton district.

Asks to have an efficient mallee sent round from Calcutta.

N. B. This is a most difficult commission, and the Secretary fears he can hold out no hopes of procuring an intelligent gardener.

From J. H. Stocqueler, Esq. dated 18th May, forwarding a re-print of the Society's Transactions, vol. I—100 copies.

From J. Davenport, Esq. Secretary to the Branch Society of Comilla, acknowledging the receipt of seeds sent by this Society, and desiring to be supplied with the Transactions.

From Mr. J. W. Masters, dated 7th June, offering a few plain remarks on the different specimens of soils from the Valley of Nepaul; presented to the Society by Dr. A. Campbell.

From the same, dated 12th June, presenting to the Society, specimens of the three primitive earths, which form the principal ingredients

in all soils, partly artificial, but supposed by Mr. Masters to be useful in comparing soils.

From the same, dated 14th June, forwarding further specimens of cotton of kinds, the produce of the Society's nursery, grown out of season.

From Mr. J. Paterson, to Dr. Strong, forwarding a sample of Soonderbund Mould.

From Thomas Bagley, Jun. to Captain Nash, dated 4th February. 1837, presenting through Mr. Allan, some selected Sea Island Cotton seeds.

From James Grant, Esq. Collector at ———, forwarding by instructions from Government, prices of grain for one month.

From the Royal Asiatic Society, its Transactions, Journal No. 6.

Dr. Huffnagle presented a specimen of cleaned cotton, the produce of his garden from Upland Georgia seed—also a skein of twist made of it, which was considered a very promising specimen.

The Society will soon have a standard by which to compare samples of cotton, from the twist and cloth now under process of carding and weaving at Fort Gloster, from the large supply of seed received from Colonel Colvin.

Specimens of Egyptian Cotton from Mr. Bell's garden, showed a considerable improvement on the former samples from the same trees. Those now produced are from straggling branches left when the bushes were cut over; the ensuing crop will determine whether the cotton degenerates in quality or not.

The Secretary also presented from his garden 14 quart bottles of tobacco seed, the produce of seed received through Dr. Wallich, from Dr. Wight of Madras—likewise four bottles of English clover seed.

The thanks of the Society were ordered to be offered for all the above communications and presentations.

JOHN BELL,

Secretary.

END OF VOL. IV.